FURUNO

Installation Manual
ECDIS
Model FMD-3100

(ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEM)

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SAFETY INSTRUCTIONS

The installer of the equipment must read the safety instructions before attempting to install the equipment.

WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury.

Warning, Caution Prohibitive Action Mandatory Action

WARNING

Do not open the equipment unless totally familiar with electrical circuits and service manual.

ELECTRICAL SHOCK HAZARD

Only qualified personnel should work inside the equipment.

Turn off the power at the mains switch-board before beginning the installation.
Fire, electrical shock or serious injury can result if the power is left on or is applied while the equipment is being installed.

Be sure that the power supply is compatible with the voltage rating of the equipment.
Connection of an incorrect power supply can cause fire or damage the equipment.

Use only the specified power cable.
Fire or damage to the equipment can result if a different cable is used.

Do not install the units of the system where they may get wet from rain or water splash, or in a dusty environment.
Water in the units can result in fire, electrical shock, or damage the equipment.

WARNING

Attach protective earth securely to the ship's body.
The protective earth (grounding) is required for the AC power supply to prevent electrical shock.

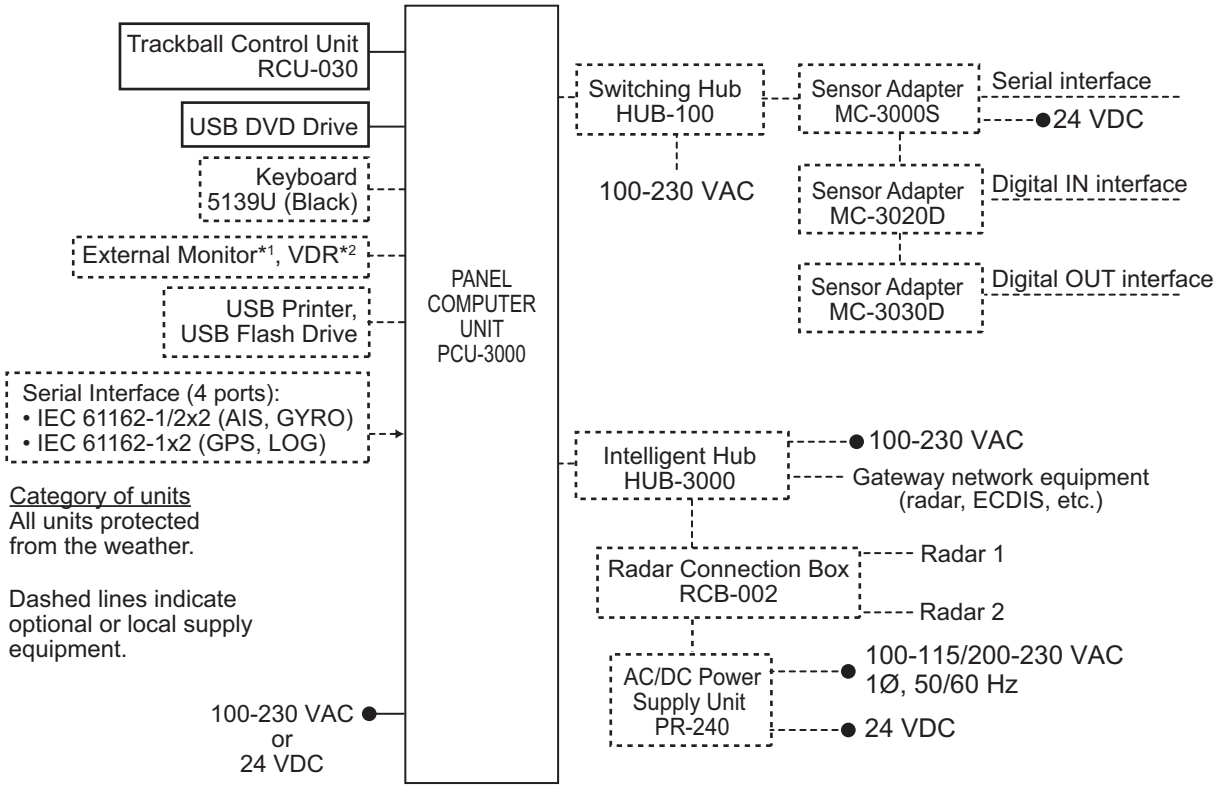
CAUTION

Observe the following compass safe distances to prevent interference to a magnetic compass:

Unit	Standard compass	Steering compass
Panel Computer Unit (PCU-3000)	0.9 m	0.6 m
Trackball Control Unit (RCU-030)	0.5 m	0.3 m
Intelligent HUB (HUB-3000)	1.20 m	0.75 m
Switching HUB (HUB-100)	1.00 m	0.60 m
Sensor Adapter (MC-3000S)	2.05 m	1.35 m
Sensor Adapter (MC-3020D)	1.05 m	0.70 m
Sensor Adapter (MC-3030D)	0.90 m	0.60 m
Radar Connection Box (RCB-002)	1.45 m	0.95 m

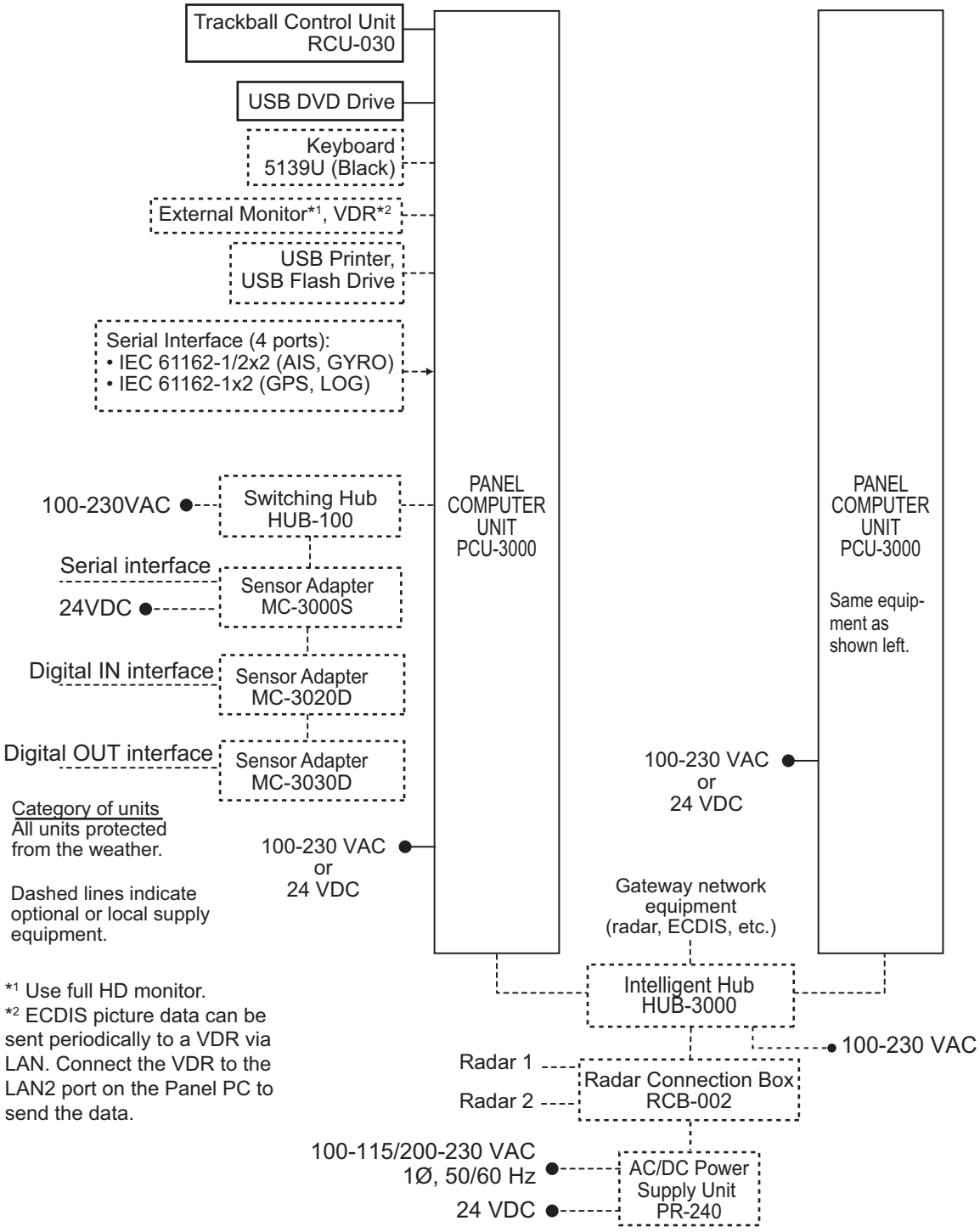
SYSTEM CONFIGURATION

Single workstation



*1 Use full HD monitor.
*2 ECDIS picture data can be sent periodically to a VDR via LAN.
Connect the VDR to the LAN2 port on the Panel PC to send the data.

Multiple workstations (Maximum 3)


Trackball Control Unit RCU-030
USB DVD Drive
Keyboard 5139U (Black)
External Monitor*1, VDR*2
USB Printer, USB Flash Drive
Serial Interface (4 ports):
• IEC 61162-1/2x2 (AIS, GYRO)
• IEC 61162-1x2 (GPS, LOG)
100-230VAC
Switching Hub HUB-100
Serial interface
24VDC
Sensor Adapter MC-3000S
Digital IN interface
Sensor Adapter MC-3020D
Digital OUT interface
Sensor Adapter MC-3030D
Category of units
All units protected from the weather.
Dashed lines indicate optional or local supply equipment.
100-230 VAC or 24 VDC
PANEL COMPUTER UNIT PCU-3000
PANEL COMPUTER UNIT PCU-3000
Same equipment as shown left.
100-230 VAC or 24 VDC
Gateway network equipment (radar, ECDIS, etc.)
Intelligent Hub HUB-3000
100-230 VAC
Radar 1
Radar 2
Radar Connection Box RCB-002
100-115/200-230 VAC 1Ø, 50/60 Hz
24 VDC
AC/DC Power Supply Unit PR-240
*1 Use full HD monitor.
*2 ECDIS picture data can be sent periodically to a VDR via LAN. Connect the VDR to the LAN2 port on the Panel PC to send the data.

EQUIPMENT LIST

Standard Supply

Name	Type	Code No.	Qty	Remarks
Panel Computer Unit	PCU-3000	-	1	
Trackball Control Unit	RCU-030	-	1	
Installation Materials	CP24-03101	001-262-570	1	For PCU-3000
Portable DVD-ROM Drive	FP24-01000	000-024-913	1	

Optional Supply

Name	Type	Code No.	Remarks
Radar Connection Box	RCB-002	-	For connection of external radar
Sensor Adapter	MC-3000S	-	Serial control unit
	MC-3020D	-	Digital IN
	MC-3030D	-	Digital OUT
Intelligent HUB	HUB-3000	-	
Switching HUB	HUB-100	-	
Rectifier	PR-240	-	
Case Gasket	OP24-28	001-169-970	For MC-3000S
	OP24-29	001-169-960	For MC-3020D/3030D
Flush Mount Kit	OP24-38	001-263-190	For RCU-030
Cable Clamp	OP24-39	001-263-210	For PCU-3000
Hood	OP24-40	001-263-230	For PCU-3000
Keyboard	OP24-41	001-263-250	For PCU-3000
Mounting Bracket	OP24-42	001-263-260	For PCU-3000
USB Dongle	ETOKEN PRO 72K	001-262-700	For PCU-3000
Crimping Tool	CRIMPFOX 10S	001-206-920	For ferrule
Installation Materials	CP03-28900	000-082-658	LAN cable, 10 m
	CP03-28910	000-082-659	LAN cable, 20 m
	CP03-28920	000-082-660	LAN cable, 30 m
	CP24-02900	001-208-050	LAN cable, 10 m, for HUB-3000
	CP24-02910	001-208-060	LAN cable, 20 m, for HUB-3000
	CP24-02920	001-208-070	LAN cable, 30 m, for HUB-3000
Cable Assy.	DVI-D/D S-LINK 5M	001-132-960-10	For external monitor unit
	MC1.5-W-L600	001-187-470-10	Between sensor adapters, 0.6 m
	MC1.5-W-L1000	001-187-480-10	Between sensor adapters, 1 m
	MC1.5-W-L2000	001-187-490-10	Between sensor adapters, 2 m
	MC1.5-W-L3000	001-187-500-10	Between sensor adapters, 3 m
	MJ-A10SPF0020A-050+	001-283-370-00	For Non-FURUNO radars (5 m)
	MJ-A10SPF0020A-100+	001-283-380-00	For Non-FURUNO radars (10 m)
	MJ-A10SPF0020A-200+	001-283-390-00	For Non-FURUNO radars (20 m)
	MJ-A10SPF0020A-300+	001-283-400-00	For Non-FURUNO radars (30 m)
Operator's Manual	OME-44840-*	000-178-755-1*	English

1. MOUNTING

NOTICE

Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.

Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

1.1 Panel Computer Unit (PCU-3000)

The PCU-3000 can be flush-mounted or desktop mounted (optional).

Mounting considerations

When selecting a desktop mounting location, keep the following points in mind:

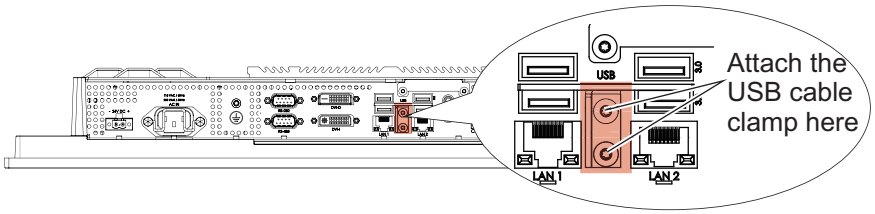
- Locate the PCU away from heat sources. The cabinet can build up heat inside, causing undue wear to electrical components.
- Choose the mounting location while considering the length of cable between the PCU and other equipment to be connected.
- Do not cover the air intakes near the connectors at the base of the PCU.
- Leave at least 100 mm clearance around the rear air vents of the unit to allow heat dissipation.
- Locate the PCU away from areas which may be subject to splash or rain.
- Referring to the outline diagrams at the back of this manual, leave sufficient space around the equipment to facilitate maintenance.
- Keep in mind the desired location of the trackball unit. Make sure there is enough room to install the Trackball Control Unit near the PCU.
- A magnetic compass will be affected if the equipment is placed too close to the magnetic compass. Observe the compass safe distances at the front of this manual to prevent interference to a magnetic compass.
- Vibration at the mounting location should be minimum.
- Alarm and alert buzzer sounds are generated from a speaker on the face of the PCU. To avoid sound dampening, do not place any object in front of the PCU. Ensure the speaker hole is kept free of dust and water.

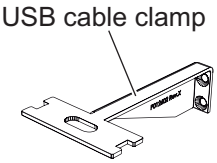
1.1.1 Flush mounting

Items to prepare for the flush mounting procedure:

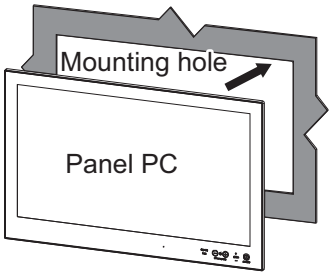
- Torx screwdriver: T10, T25.

1. Attach the USB cable clamp to the PCU using the torx screws (M3×4, 2 pcs, included).



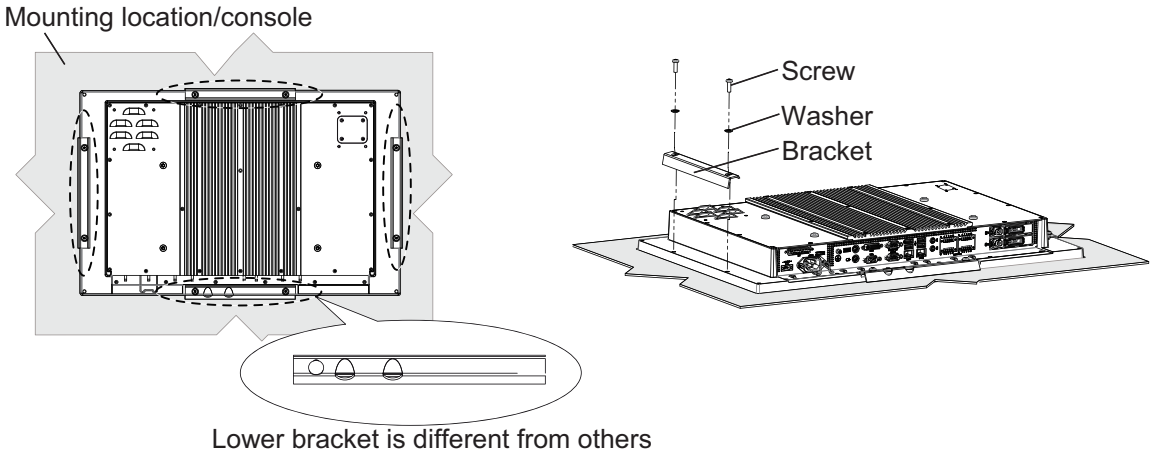


2. Make a cutout where the PCU is to be located, referring to the outline drawings at the back of this manual.
3. Connect all cables to their appropriate slot on the PCU. Take care to leave enough slack in the cables to allow access for maintenance and repair.
4. Slide the unit into the cutout. Take care to not to bend or squash any cabling.

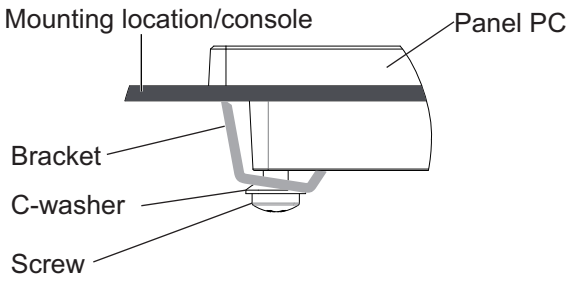


Note: User controls and ports should be facing downwards.

5. Taking care not to confuse the bracket types (see figure below), screw each bracket into place, using M5x16 screws and C-washers.



6. Ensure all four sides are equally tight, taking care not to over-tighten the screws.

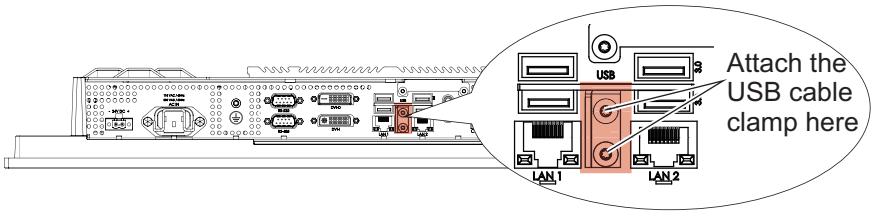


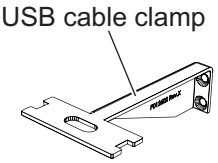
1.1.2 Desktop mounting (optional)

Items to prepare for the procedure:

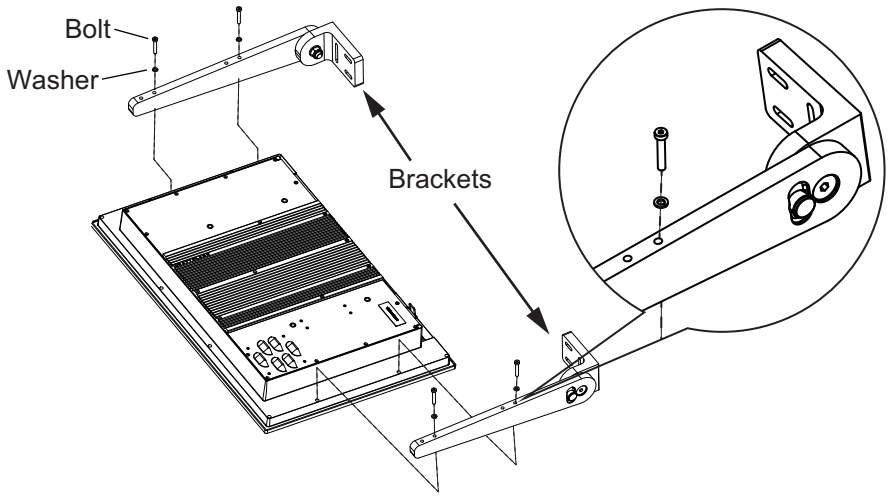
- Torx screwdriver: T10, T25.

1. Attach the USB cable clamp to the PCU using the torx screws (M3×4, 2 pcs, included).



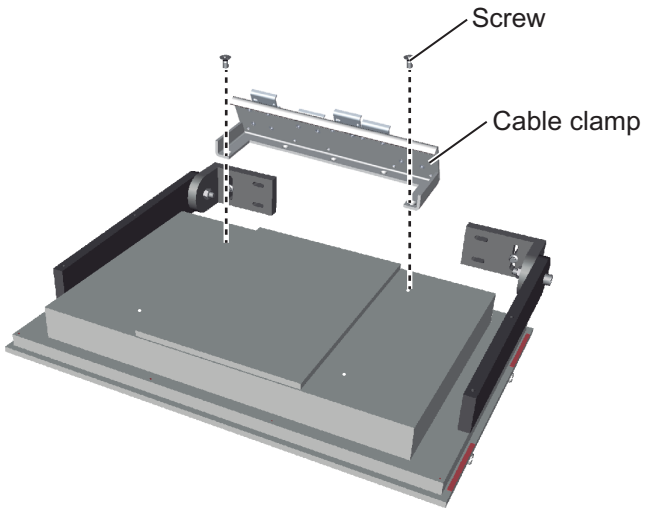


2. Attach the brackets to the PCU-3000, referring to the figure below. It is essential that the brackets are attached using the bottom screw holes, as shown in the diagram below. Failure to do so will result in undue vibrations.



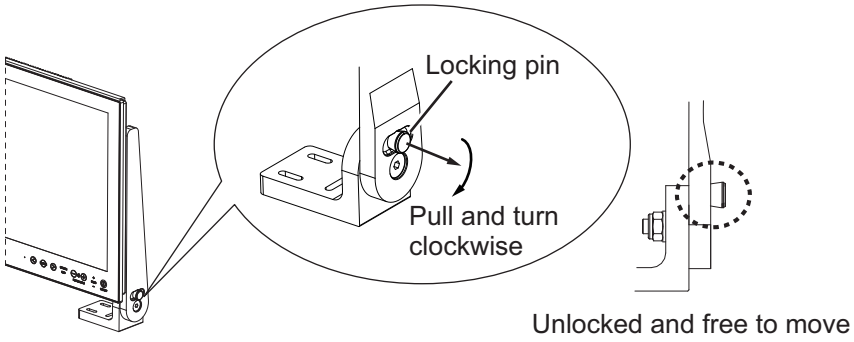
Note: Ensure the PCU-3000 is placed face-down on a soft, clean area to avoid damage to the screen.

3. Attach the cable clamp (OP24-39, supplied) to the rear of the PCU-3000 using the screws (M6×12, 2 pcs., included in option kit).

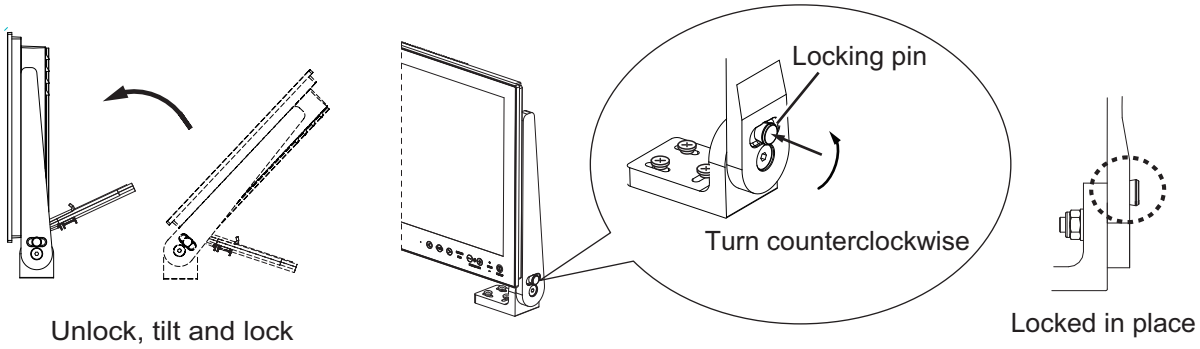


4. Set the PCU in the desired installation location.

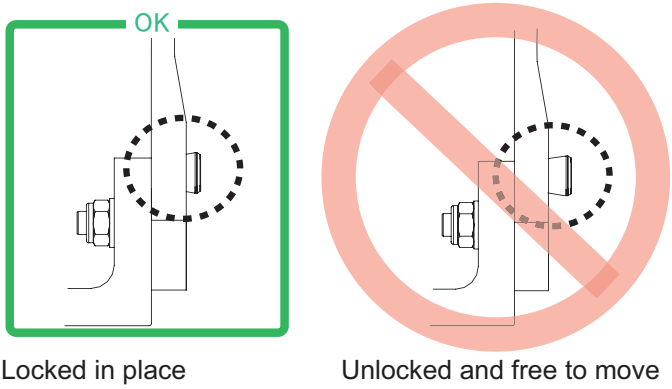
5. Referring to the figure below, tilt the PCU 90° rearwards by unlocking the brackets. Hold the unit in place, then pull and turn the locking pins clockwise, one at a time, to set the pin in the unlock position.



6. After tilting the PCU turn the locking pin counter clockwise to lock the bracket in place.
7. Attach the footings of the brackets in place at the mounting location using the self-tapping screws (ϕ6×30, 6 pcs.) included in the mounting kit.
8. Hold the unit in place, then pull and turn the locking pins, one at a time, clockwise to set the pins in the unlock position.
9. Referring to the figure below, set the PCU upright at a comfortable viewing angle, then turn the locking pin coutnerclockwise to lock the brackets in place.



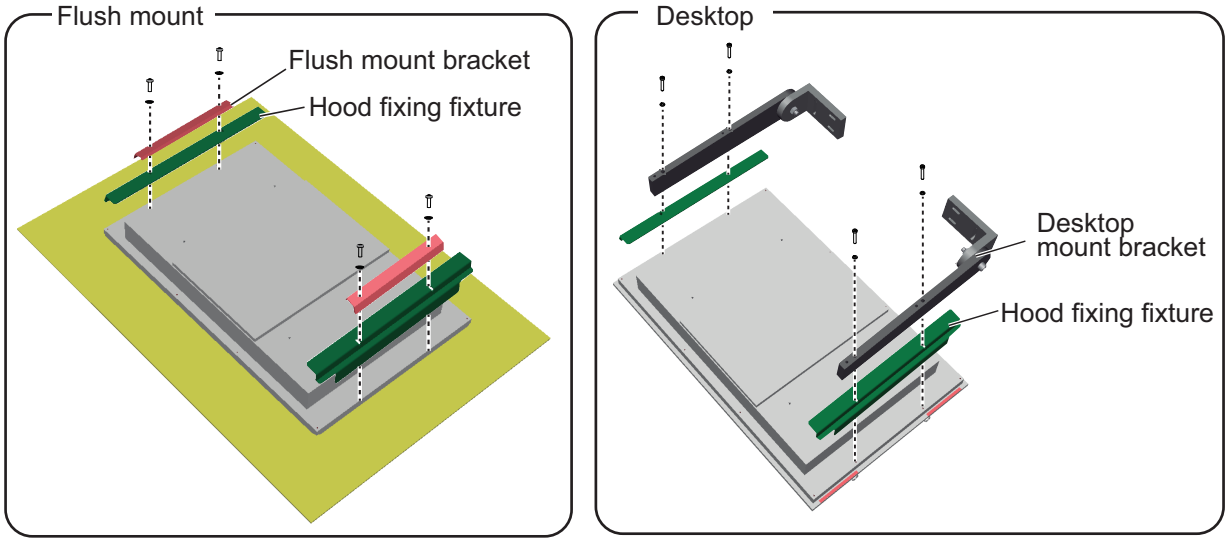
Note: Be sure that the brackets are locked in place securely with the locking pins, to prevent bodily injury or damage to the equipment.



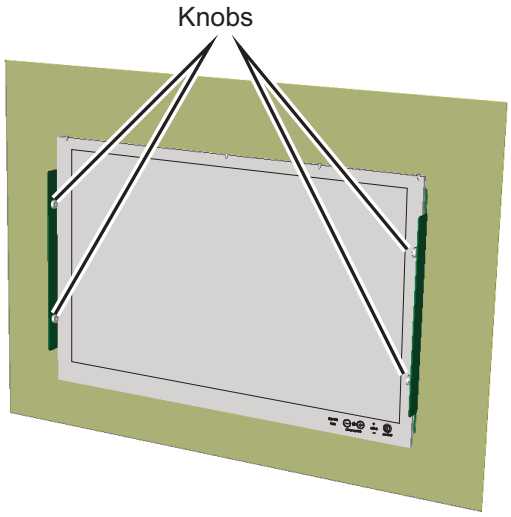
1.1.3 How to attach the hood (Optional)

To install the optional hood (OP24-40), do the following:

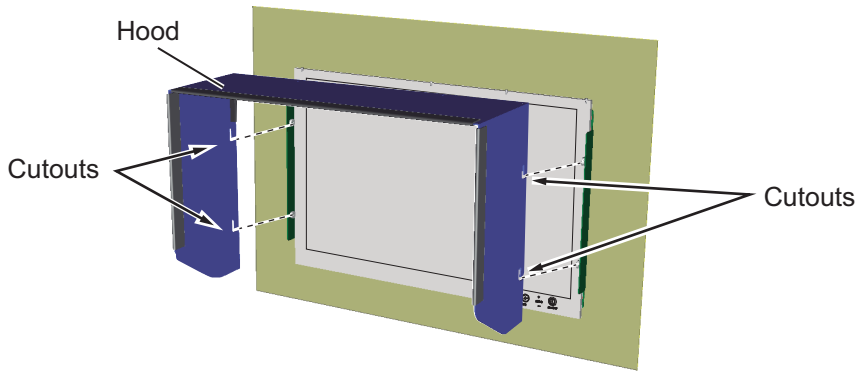
1. Referring to the figure below, fit the hood reinforcement fixture to the back of the PCU-3000.
   For flush-mounting: Install the hood fixing fixture with the flush mount brackets.
   For desktop mounting: Install the hood fixing fixture with the desktop mount brackets.
   Note: The screws and washers to fix the hood fixing fixture are supplied with the PC-3000.



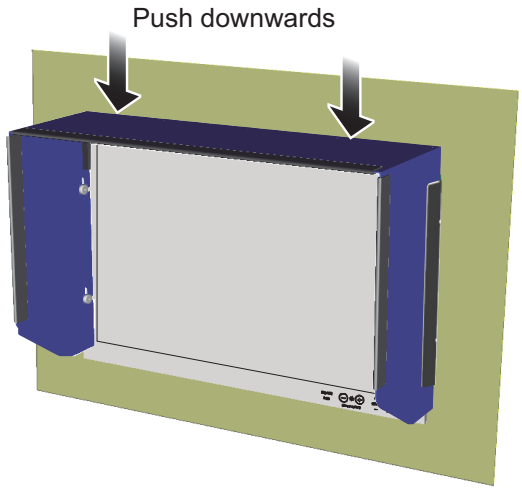
2. Loosen the four knobs on the hood fixing fixture, referring to the figure below.



3. Using the cutouts in the hood, set the hood in place between the knobs and the hood fixing fixture.



4. Referring to the figure below, push the hood down to align the cutouts with the knobs.



5. Fasten the knobs to secure the hood in place.

1.1.4 How to install the keyboard (OP24-41, Optional)

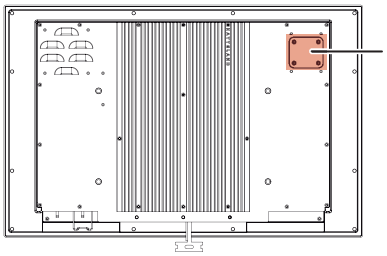
1. Attach four fasteners (small, supplied with the optional kit) to the bottom of the keyboard.
2. Attach four fasteners (large, supplied with the optional kit) to the small fasteners used in step 1.
3. Remove the paper from four fasteners.
4. Fasten the keyboard to the installation location.

1.1.5 How to replace the USB dongle, CFAST memory card or SSD

Referring to the table below, prepare the necessary tools to replace the USB dongle, CFAST memory card or SSD.

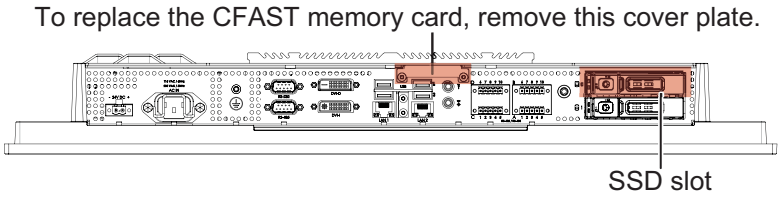
Part	Tool	Type
USB dongle	Torx screwdriver	T10
CFAST memory card		
SSD	Philips-head screwdriver	PH2

Replacing the USB dongle



Rear of PSU-3000

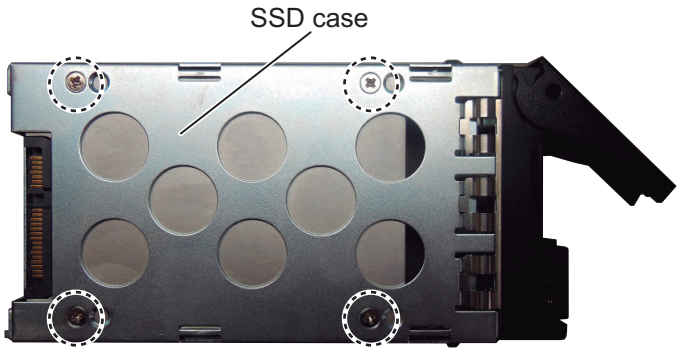
Replacing the CFAST memory card



Replacing the SSD

Referring to the figure above, remove the SSD case from the SSD slot. Unfasten the screws cricled in the figure below, then remove the SSD.

Note: When replacing the SSD, only replace the “0” slot drive. Do not replace the “1” slot drive.



1.2 Trackball Control Unit (RCU-030)

The Trackball Control Unit (RCU-030) can be mounted on a desktop in two configurations.

- Desktop with mounting plate (Standard installation)
- Flush mounted inside a console (Optional)

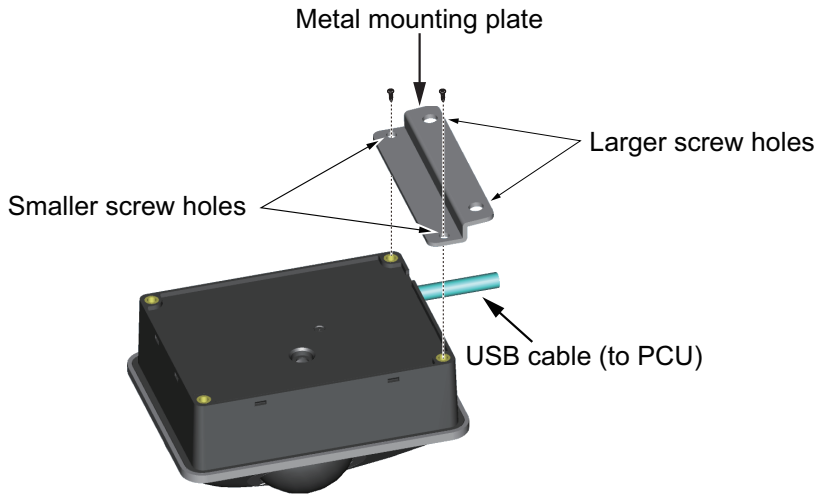
Mounting considerations

When selecting a mounting location, keep the following points in mind:

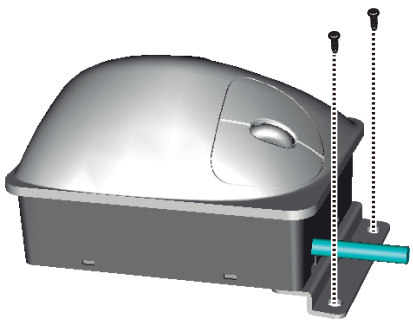
- Select a location where the unit can be operated conventionally.
- Locate the unit away from heat sources. The cabinet can build up heat inside, causing undue wear to electrical components.
- Locate the unit away from areas which may be subject to water splash and rain.
- Referring to the outline diagrams at the back of this manual, leave sufficient space around the equipment to facilitate maintenance.
- Consider the length of the signal cable and the distance between the unit and the PCU. Leave enough slack in the cable to allow for maintenance.
- A magnetic compass will be affected if the equipment is placed too close to the magnetic compass. Observe the compass safe distances at the front of this manual to prevent interference to a magnetic compass.

1.2.1 Desktop mounting (with metal mounting plate)

1. Fix the metal mounting plate to the bottom of the unit, referring to the figure below.



2. Fix the unit to the mounting location using self-tapping screws (supplied locally).

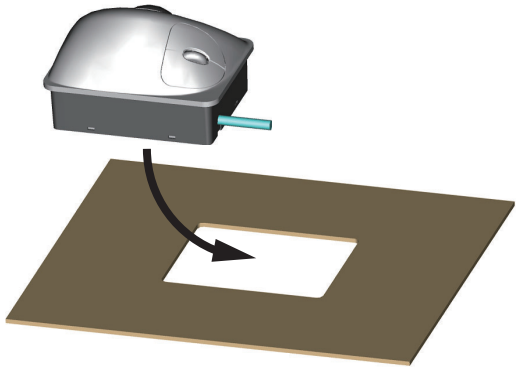


1.2.2 Flush mounting (optional)

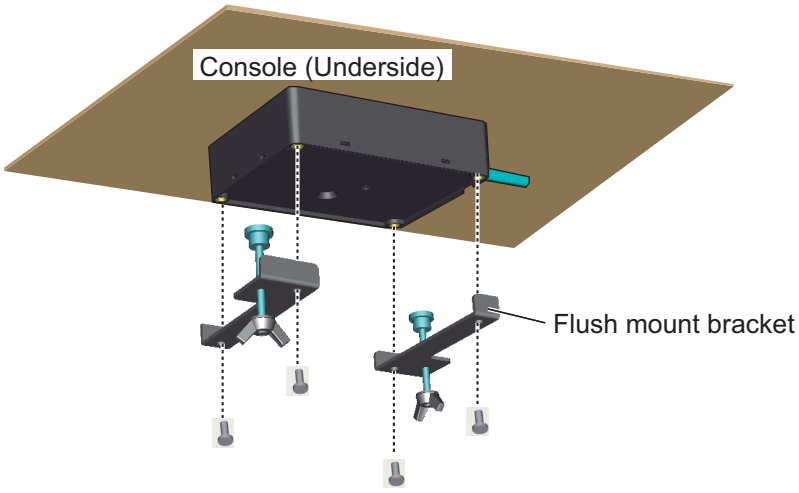
You can use the optional FM FIXTURE ASSEMBLY kit (OP24-38) to flush-mount the unit.

The flush mount location must have a thickness of at least 10 mm, with a maximum thickness of 20 mm.

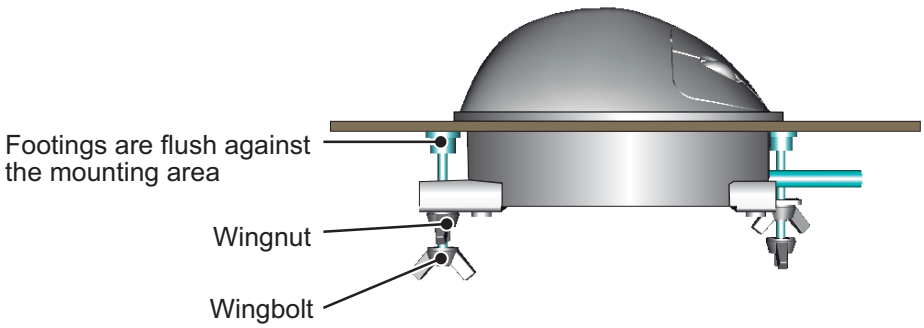
1. Referring the outline drawing at the back of the manual, mark and cut a hole in the position you wish to locate the unit.
2. Set the USB cable through the hole, then place the unit inside the hole.



3. Attach the brackets to the unit's under side using the screws included in the flush mounting kit.



4. Fasten the wingbolts until the footing is flush against the mounting area.



5. Tighten the wingnuts until the unit is firmly secured.

1.3 Sensor Adapter MC-3000S/3020D/3030D (Optional)

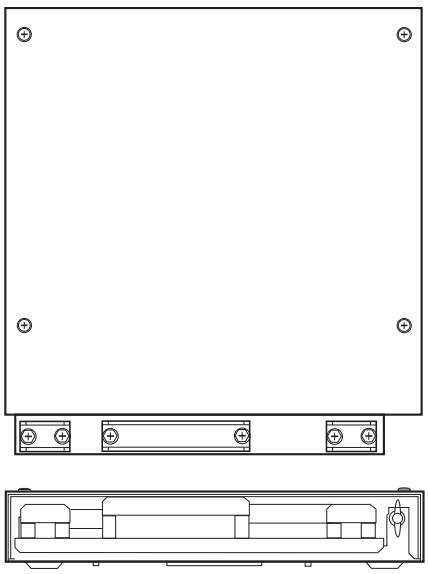
Mounting considerations

When you select a mounting location, keep in mind the following points:

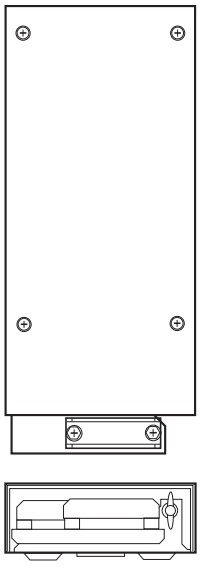
- Locate the equipment away from heat sources because of heat that can build up inside the cabinet.
- Take into account the length of the cables to connected to the equipment when choosing an installation location.
- Vibration at the mounting location should be minimum.
- Locate the equipment away from places subject to water splash and rain.
- Referring to the outline diagrams at the back of this manual, leave sufficient space around the equipment to facilitate maintenance.
- A magnetic compass will be affected if the equipment is placed too close to the magnetic compass. Observe the compass safe distances at the front of this manual to prevent interference to a magnetic compass.
- Select the mounting location considering the numbers of the sensor adapters connected.
  A maximum of eight MC-3000S can be connected to a sensor network (for redundant connection:16). Maximum 10 sensor adapters (MC-3020D/3030D) can be connected to a single MC-3000S.
- Select the mounting location so that the length of cables among the sensor adapters (MC-3000S, 3020D and 3030D) is less than 6 m. If the length is more than 6 m, the equipment may not work properly.

How to mount the sensor adapter

1. Unfasten four binding screws to remove the cover from the Sensor Adapter.
2. Fasten four self-tapping screws (4x20, supplied) to fix the Sensor Adapter.
3. Reattach the cover.



MC-3000S



MC-3020D/3030D

1.4 Intelligent Hub HUB-3000 (Optional)

Use the optional Intelligent Hub HUB-3000 to connect gateway network equipment. This network cannot be connected with the LAN network on board. Note that a commercial PC cannot be connected to this network, other than for maintenance.

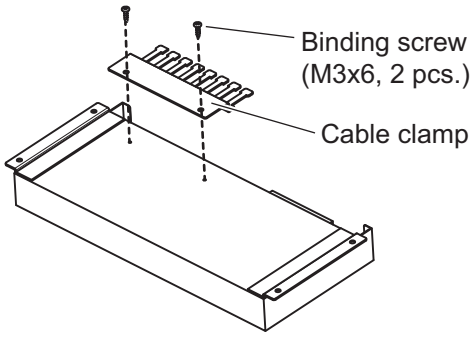
Mounting considerations

Keep the following points in mind when selection a mounting location:

- Locate the HUB-3000 away from heat sources. The cabinet can build up heat inside, causing undue wear to electrical components.
- Take into account the length of the cables to connected to the equipment when choosing an installation location.
- Locate the HUB-3000 away from areas which may be subject to splash or rain.
- Referring to the outline diagrams at the back of this manual, leave sufficient space at the rear of the HUB-3000 to facilitate maintenance.
- A magnetic compass will be affected if the equipment is placed too close to the magnetic compass. Observe the compass safe distances at the front of this manual to prevent interference to a magnetic compass.
- Vibration at the mounting location should be minimum.

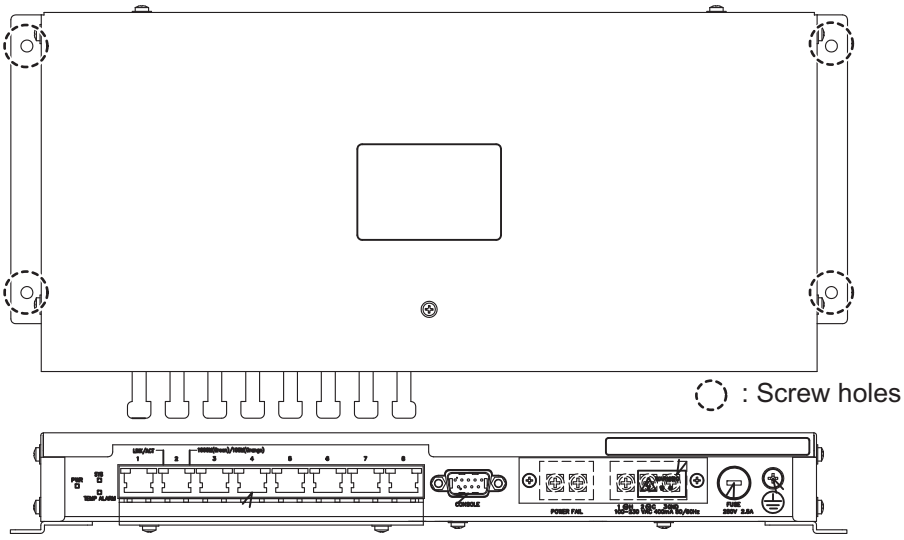
How to mount the intelligent hub HUB-3000

1. Use two binding screws (M3x6, supplied) to attach the cable clamp (supplied) to the bottom of the HUB-3000.



HUB-3000, bottom view

2. Fasten four self-tapping screws (4x20, supplied) to fix the unit in place.



1.5 Mounting the Switching Hub HUB-100 (Optional)

Use the optional Switching HUB HUB-100 to connect sensor networks. This network cannot be connected with the LAN network on board. Note that a commercial PC cannot be connected in this network, other than for the maintenance.

For the mounting procedures, see the operator's manual for HUB-100 (Pub. No. OMC-35191).

Mounting considerations

Keep the following points in mind when selection a mounting location:

- Locate the HUB-100 away from heat sources. The cabinet can build up heat inside, causing undue wear to electrical components.
- The HUB-100 should be fixed firmly so that rough seas and vibrations do not cause the unit to move in any manner.
- Locate the HUB-1000 away from areas which may be subject to splash or rain.
- Referring to the outline diagrams at the back of this manual, leave sufficient space at the rear of the equipment to facilitate maintenance.
- A magnetic compass will be affected if the equipment is placed too close to the magnetic compass. Observe the compass safe distances at the front of this manual to prevent interference to a magnetic compass.
- Vibration at the mounting location should be minimum.

1.6 Radar Connection Box RCB-002 (Optional)

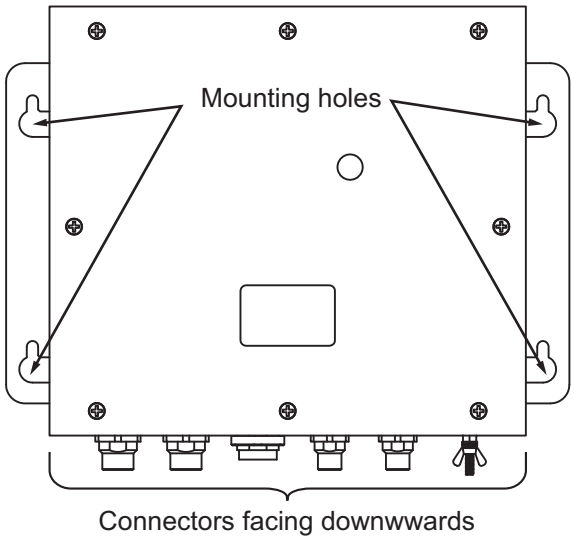
You can display signals from up to two external radars on the FMD-3100 by using the RCB-002. The RCB-002 must be connected via the Gateway Network.

Mounting considerations

Keep the following points in mind when selection a mounting location:

- Locate the RCB-002 away from heat sources. The cabinet can build up heat inside, causing undue wear to electrical components.
- Take into account the length of the cables to connected to the RCB-002 when choosing an installation location.
- The RCB-002 should be fixed firmly so that rough seas and vibrations do not cause the unit to move in any manner.
- Locate the RCB-002 away from areas which may be subject to splash or rain.
- Referring to the outline diagrams at the back of this manual, leave sufficient space at the rear of the RCB-002 to facilitate maintenance.
- A magnetic compass will be affected if the equipment is placed too close to the magnetic compass. Observe the compass safe distances at the front of this manual to prevent interference to a magnetic compass.
- Vibration at the mounting location should be minimum.

1. Referring to the outline drawing at the back of this manual, drill four holes ($\phi 5 \times 20$) in the mounting location.
2. Secure the RCB-002 firmly in place using $\phi 5 \times 20$ tapping screws. Make sure the RCB-002 is not subject to undue vibrations.



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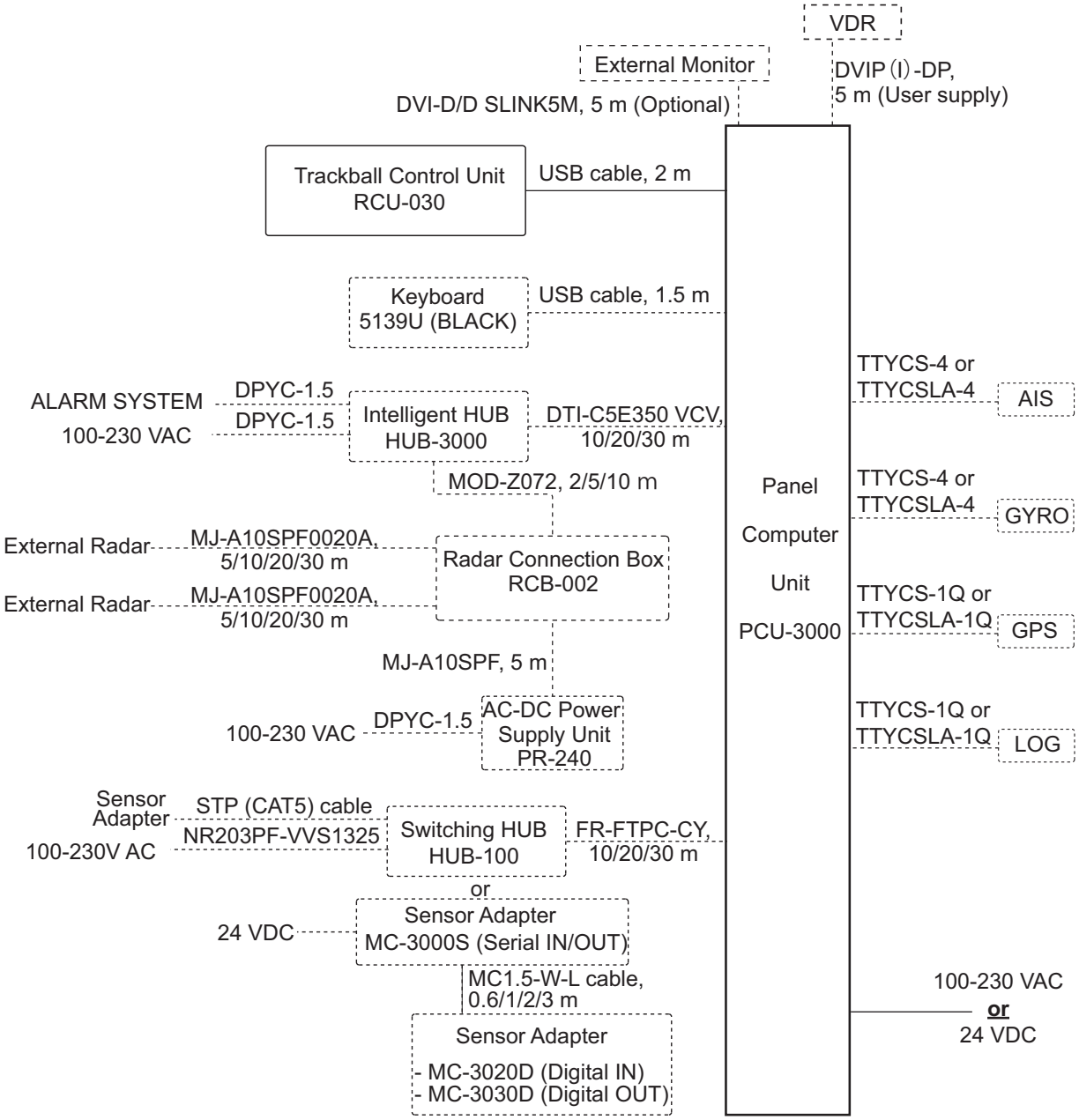
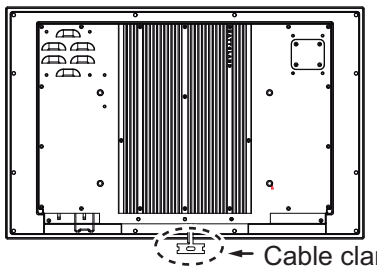
2. WIRING

The illustration on this page shows the general connection between FMD-3100 and external equipment. For detailed information, see the interconnection diagram at the back of this manual. Many of the cables mentioned are JIS (Japan Industry Standard) cables. If not available locally, use the equivalent. See the cable guide in the Appendix for how to select equivalent cables.



Wiring considerations

- USB cable lengths should be within 5 m, with or without the USB extension cable. Full function cannot be guaranteed if the overall USB length exceeds 5 m.
- The PCU-3000 is not compatible with the USB 3.0 equipments.
- USB cables should be secured using the clamp highlighted in the figure below.



- LAN cable lengths between units should be within 50 m.
- The DVI-D port outputs FULL HD resolution. Make sure the cables connected to the DVI-D port are 5 m or less.
- If extension or division of the DVI or ERGB cables is required, use the dividers listed below:
  - DVI cable divider: D8013F (maker: IMAGENICS)
  - RGB divider: CIF-12H, DD-106 or D8013F (maker: IMAGENICS)
- Ensure all grounding wires are connected between grounding terminals on each equipment and ship earth.
- If a UPS (user supply) is connected to this equipment, ensure the grounding lamp does not light up.
- Use the following LAN cables for the network if they are available locally.
  - Sensor Network: Cat5 or better.
  - Gateway Network: Cat5e or better.
- If LAN cables are not available locally, use the optional LAN cables as below:
  - Sensor network - FR-FTPC-CY (Cat5 equivalent).
  - Gateway network - DTI-C5E350 VCV (Cat5e equivalent).
- ECDIS control unit RCU-024 and RCU-026 are not compatible with this equipment.
- When connecting this equipment to a VR-3000/S, use the DVI-I port. The DVI-I port outputs FULL HD resolution and requires a synchronizer to convert the output to UXGA.
- When connecting a VDR device via LAN, connect the VDR device to the LAN2 port.

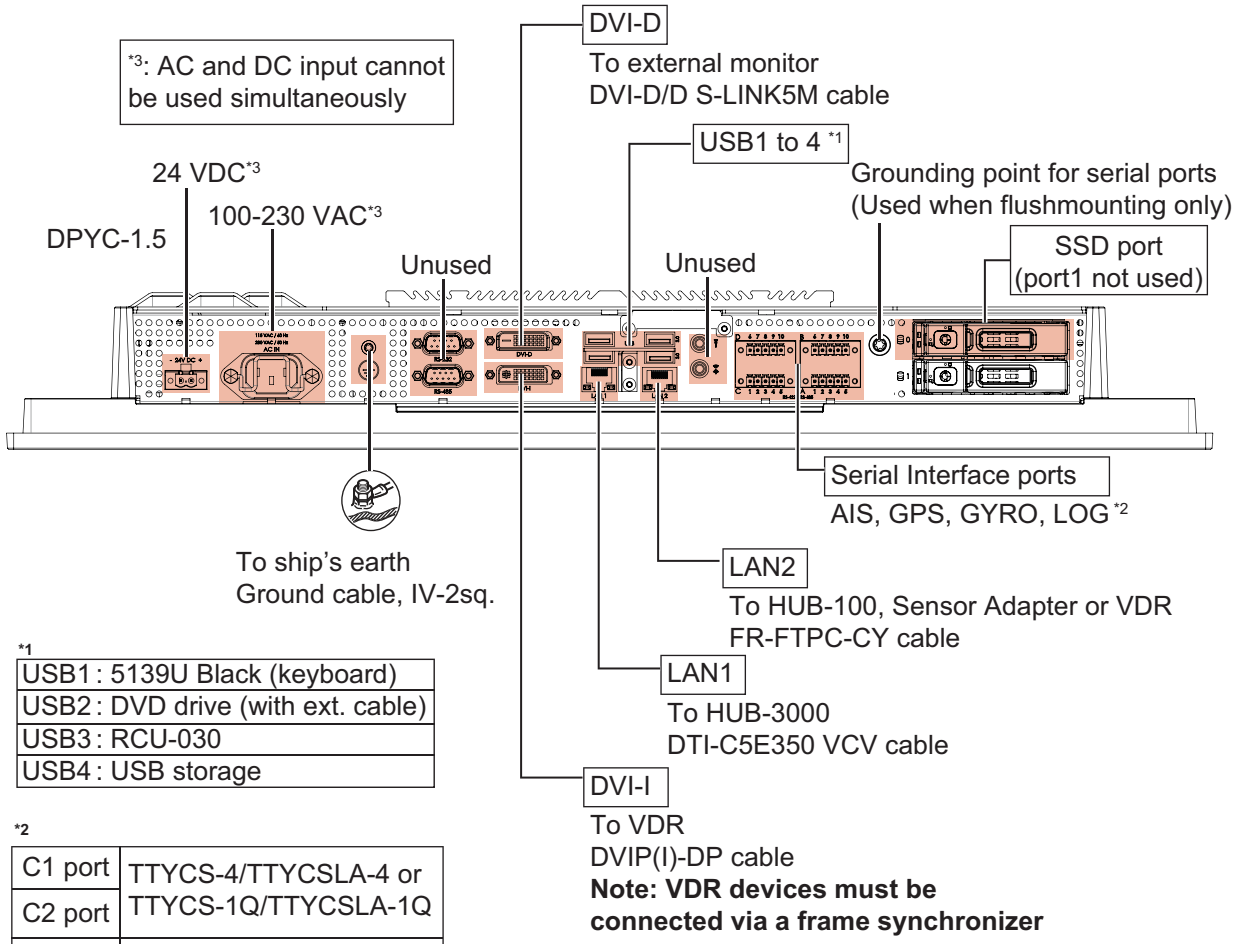
Network and sensor considerations

- For Sensor network construction, use the optional Switching Hub HUB-100.
- For Gateway network construction use the optional Intelligent Hub HUB-3000.
- Do not connect the vessel's on-board LAN to either of the above networks. Also, commercial PCs cannot be connected to the gateway network, other than for maintenance.
- Connect to other ECDIS units and radars (FEA-2xx7 or FAR-2xx7 series radars) using the gateway network.
- When constructing a network with two or more FAR-2xx7 radars, an FMD-3x00 unit and using a HUB-3000, the HUB-3000 querier must be configured. To configure the querier, consult with a Furuno engineer.
- The FMD-3100 processor unit does not support IGMP snooping or CGMP enabled switch.
- The FMD-3100 does not have a router or repeater hub function.
- The Switching Hub HUB-100 is optionally available for connection to the FMD-3100.
- The Switching HUB HUB-100 does not support IGMP snooping or GCMP enabled switch.
- When you use IEC61162-450 compatible sensors, set [Transmission Group] on the [Common Installation Settings] menu. Only service technicians can access the [Common Installation Settings] menu. Contact your FURUNO dealer to set it.

2.1 Panel Computer Unit PCU-3000

2.1.1 Connections to the PCU-3000

Referring to the figure below, connect the PCU to its respective peripherals.



*1

USB1 : 5139U Black (keyboard)
USB2 : DVD drive (with ext. cable)
USB3 : RCU-030
USB4 : USB storage

*2

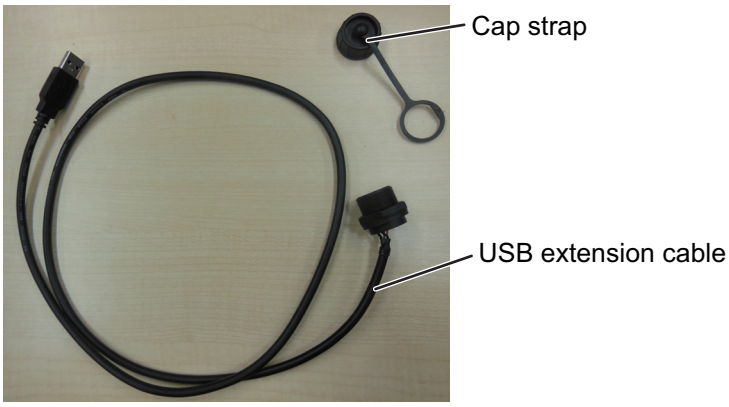
C1 port	TTYCS-4/TTYCSLA-4 or TTYCS-1Q/TTYCSLA-1Q
C2 port	
C3 port	TTYCS-1Q or TTYCSLA-1Q
C4 port	

Depending on your power supply (applied voltage), choose the correct cabling for power input, referring to the table below.

Voltage	Cable	Description
230 VAC	FS-CABLE EU cable	Type F "Schuko", included with PCU-3000. EUR TYPE F IEC
100 VAC	80099 cable	Type B, included with PCU-3000. US TYPE B IEC
24 VDC	JIS cable	See paragraph 2.1.3 to fabricate the power cable.

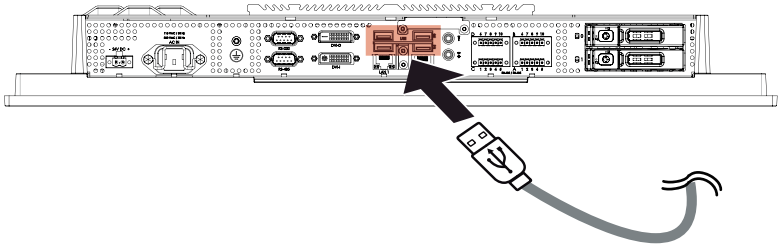
2.1.2 Connecting the flush mountable USB Extension Cable

You may require an extension from the USB port on the PCU. A 1m length USB extension cable is included with the PCU. When using another USB extension cable, make sure the total length is shorter than 5 m.



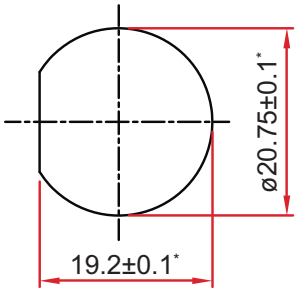
You can connect the flush-mounted extension cable by doing the following:

1. Connect the USB extension cable to a USB port on the PCU.



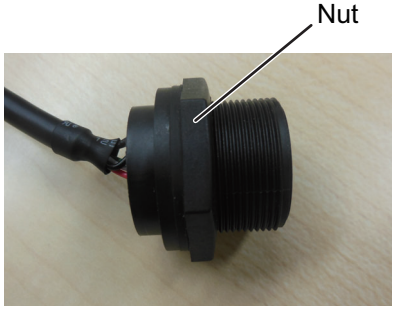
2. Referring to the figure below, make an installation hole where necessary.

Dimensions for installation hole



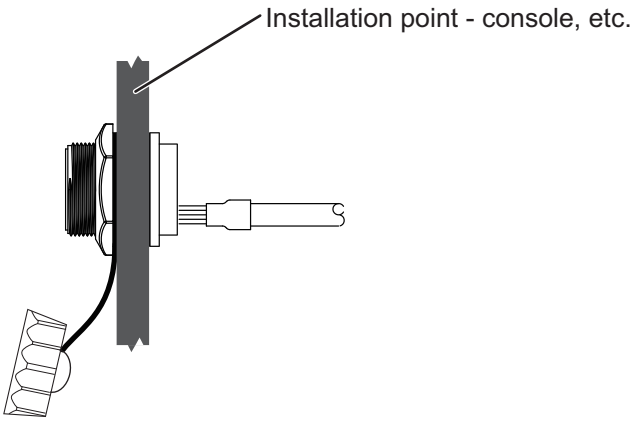
*Measurement units are in mm

3. Unfasten the nut.



4. Insert the cable into the installation hole from the rear.

5. Place the cap strap, then tighten the nut to secure the cable. See the figure below.

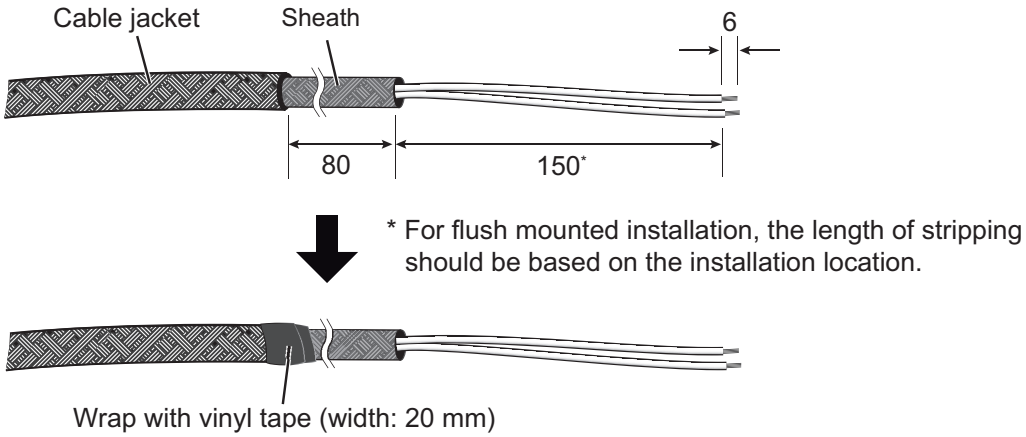


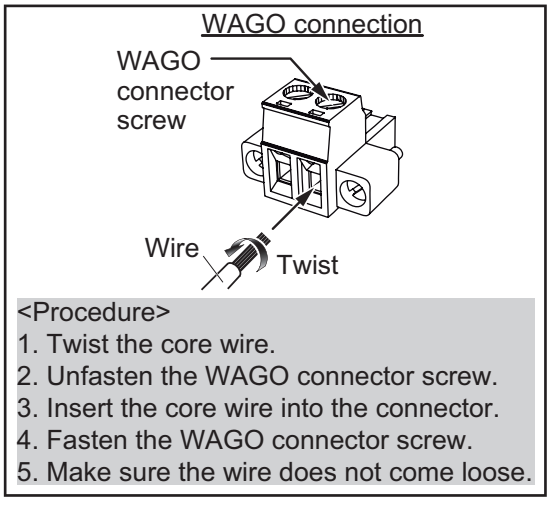
Note: Always screw the cap on when the extension cable is not in use.

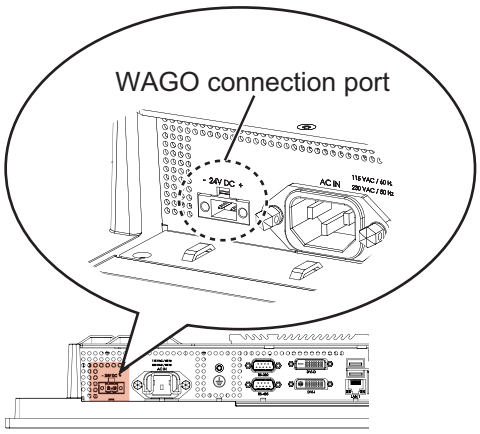
2.1.3 Fabricating the power cables

When using AC power, connect the unit with the supplied AC power cables. If the power supply is DC, fabricate DPYC-1.5 cables as shown below. Wago connectors must also be fitted.

For cable clamp location when using DPCY-1.5 cables, see paragraph 2.1.6.

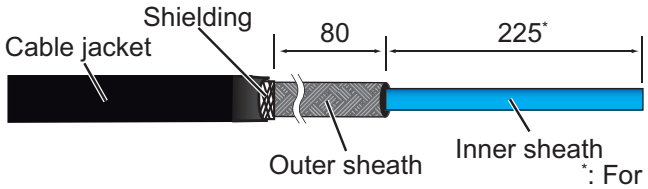

Cable jacket
Sheath
6
80
150*
* For flush mounted installation, the length of stripping should be based on the installation location.
Wrap with vinyl tape (width: 20 mm)


WAGO connection
WAGO connector screw
Wire
Twist
<Procedure>
1. Twist the core wire.
2. Unfasten the WAGO connector screw.
3. Insert the core wire into the connector.
4. Fasten the WAGO connector screw.
5. Make sure the wire does not come loose.

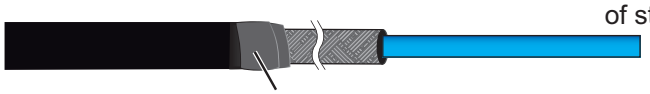


2.1.4 Fabricating LAN cables

Fabricate the LAN cable (FR-FTPC-CY, DTI-C5E350 VCV), as shown below. (Wrap both edges of the armor with vinyl tape.) Confirm that the shield of the cable touches to the shell of the modular plug.



*: For flush mount installations, adjust the length of stripped cable to suit your conditions

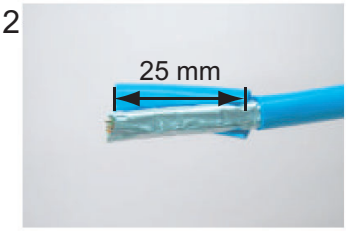


Cover the cable jacket with insulated tape (20 mm width)

1

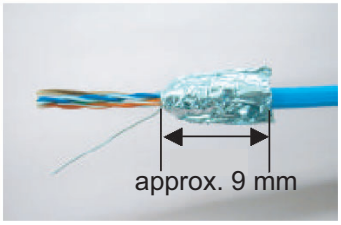
Expose inner sheath.

2



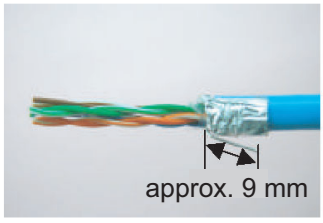
Remove the sheath by approx 25 mm. Be careful not to damage inner shield and cores.

3



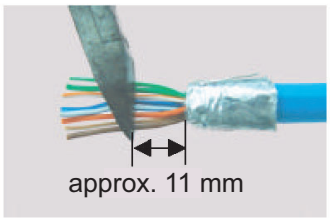
Fold back the shield, wrap it onto the outer sheath and cut it, leaving 9 mm.

4



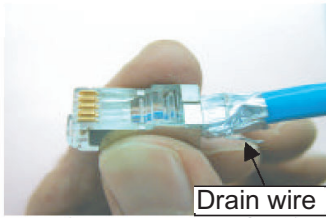
Fold back drain wire and cut it, leaving 9 mm.

5



Straighten and flatten the core in order and cut them, leaving 11 mm.

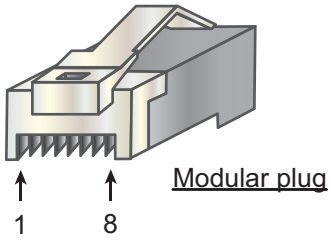
6



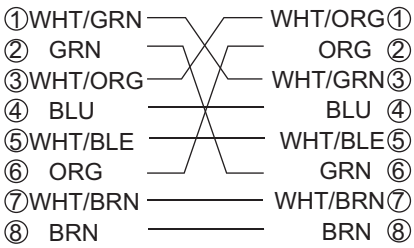
Insert the cable into the modular plug so that the folded part of the shield enters into the plug housing. The drain wire should be located on the tab side of the jack.

7

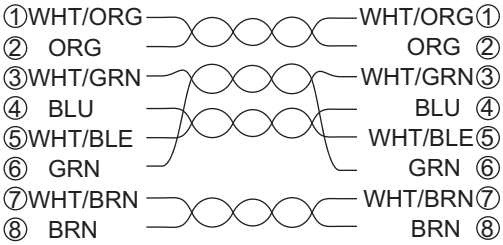
Using special crimping tool MPT5-8 (PANDUIT CORP.), crimp the modular plug. Finally check the plug visually.



[Cross cable]



[Straight cable]



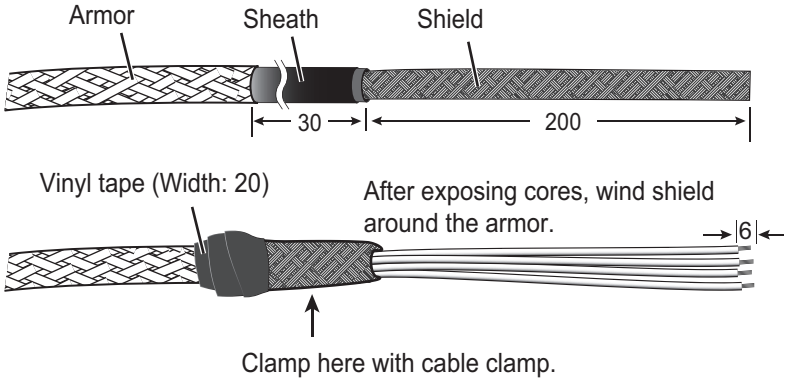
2.1.5 Fabricating JIS cables

Fabricate JIS cables as shown below to connect them to the WAGO connectors on the PCU-3000 (See following page for WAGO connection).

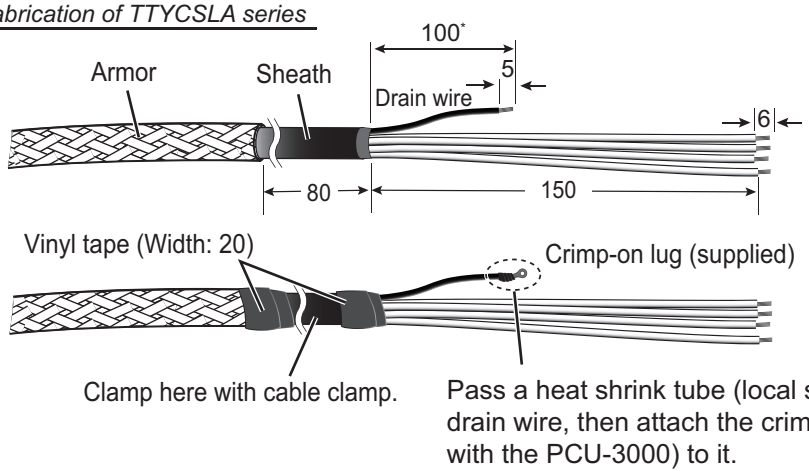
After fabricating the cable, attach the WAGO connector and EMI ferrite core (supplied). For how to attach the WAGO connecor and EMI ferrite core, see the next page.

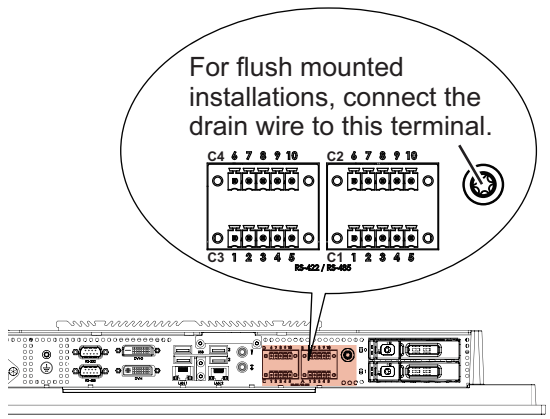
Fabrication of TTYCS series

NOTE: All dimension in millimeters



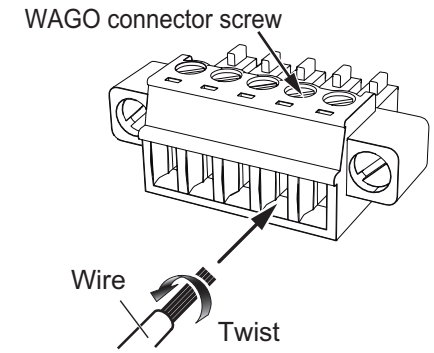
Fabrication of TTYCSLA series




For flush mounted installations, connect the drain wire to this terminal.
C4 6 7 8 9 10
C2 6 7 8 9 10
C3 1 2 3 4 5
C1 1 2 3 4 5
RS-422 / RS-485

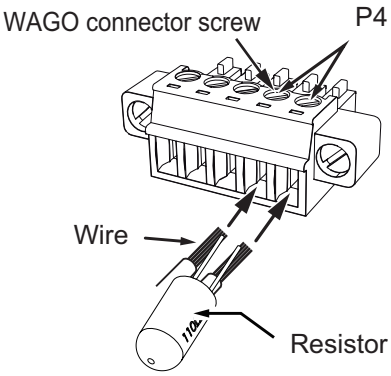
How to connect the JIS cables to the WAGO connectors

WAGO connectionfor IEC161162-1 lines



<Procedure>
1. Twist the core wire.
2. Unfasten the WAGO connector screw.
3. Insert the core wire into the connector.
4. Fasten the WAGO connector screw.
5. Make sure the wire does not come loose.

WAGO connectionfor IEC161162-2 lines



<Procedure>
1. Twist the core wire.
2. Unfasten the WAGO connector screw.
3. Insert the core wire with the resistor into the connectors P4 & P5.
4. Fasten the WAGO connector screw.
5. Make sure the wire does not come loose.

How to attach the EMI ferrite core

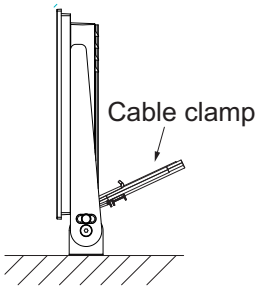
Attach the EMI ferrite core (supplied) to each connected cable group, as close to the WAGO connector as possible, leaving the drain wire loose (See figure below).

How to set input specifications for WAGO connection (C1 to C4)

Port No.	PIN No.	Signal	In/ Out	Description	IEC61162-2	IEC61162-1
C1	1	TxD-	Out	Serial CH1,Output IEC61162-1/2	TTYCS(LA)-4	TTYCS(LA)-1Q
	2	TxD+	Out	Serial CH1,Output IEC61162-1/2		
	3	ISOGND	-	Isolation GND (CH1)		No connection
	4	RxD-	In	Serial CH1,Input IEC61162-1/2		TTYCS(LA)-1Q
	5	RxD+	In	Serial CH1,Input IEC61162-1/2		
C2	6	TxD-	Out	Serial CH2,Output IEC61162-1/2	TTYCS(LA)-4	TTYCS(LA)-1Q
	7	TxD+	Out	Serial CH2,Output IEC61162-1/2		
	8	ISOGND	-	Isolation GND (CH2)		No connection
	9	RxD-	In	Serial CH2,Input IEC61162-1/2		TTYCS(LA)-1Q
	10	RxD+	In	Serial CH2,Input IEC61162-1/2		
C3	1	TxD-	Out	Serial CH3,Output IEC61162-1	-	TTYCS(LA)-1Q
	2	TxD+	Out	Serial CH3,Output IEC61162-1		
	3	ISOGND	-	Isolation GND (CH3)		No connection
	4	RxD-	In	Serial CH3,Input IEC61162-1		TTYCS(LA)-1Q
	5	RxD+	In	Serial CH3,Input IEC61162-1		
C4	6	TxD-	Out	Serial CH4,Output IEC61162-1	-	TTYCS(LA)-1Q
	7	TxD+	Out	Serial CH4,Output IEC61162-1		
	8	ISOGND	-	Isolation GND (CH4)		No connection
	9	RxD-	In	Serial CH4,Input IEC61162-1		TTYCS(LA)-1Q
	10	RxD+	In	Serial CH4,Input IEC61162-1		

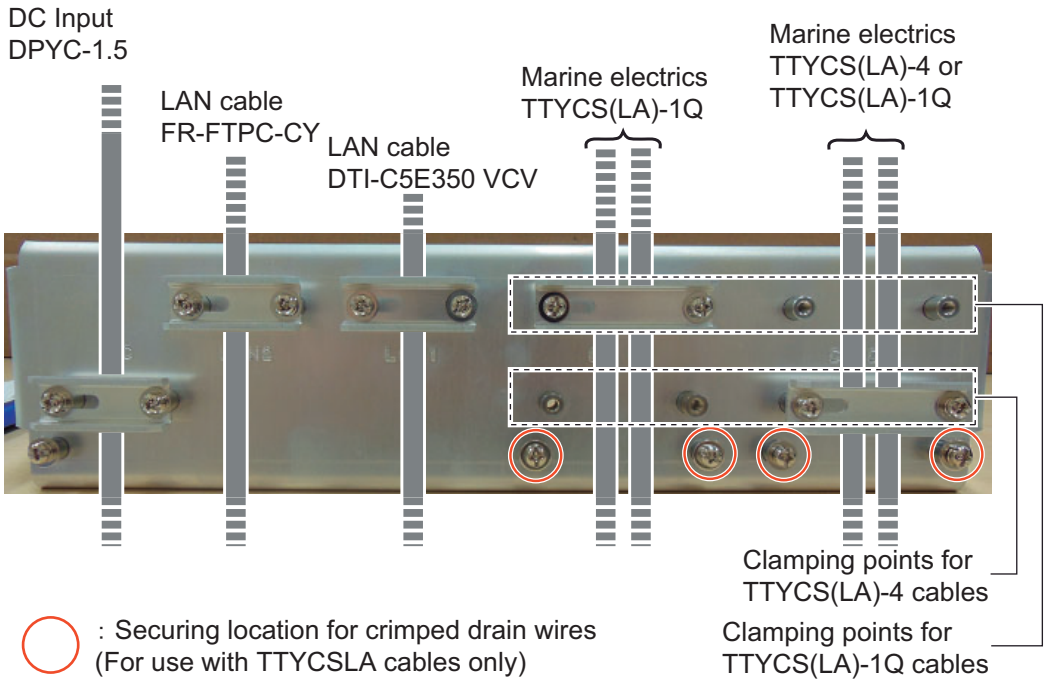
2.1.6 Securing cables to the cable clamp

When installing the unit with the desktop option, use the cable clamp to secure the electrical wiring and LAN cables.



When not using the cable clamp, drain wires must be connected to the grounding point on the PCU-3000 (See the figure in paragraph 2.1.1).

When using the cable clamp, drain wires with crimping lugs must be connected to the cable clamp, as shown in the figure below.

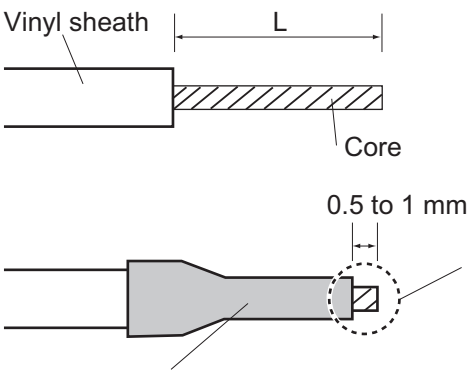


2.2 Sensor Adapters (Optional)

Maximum eight MC-3000S can be connected to a sensor network (for the redundant connection: 16). The MC-3000S (serial input/output, IEC61162-2/1, 4ch) can connect max. 10 sensor adapters using the MC1.5-W cables.

To connect the lines to the connector on the sensor adapter, use the rod terminal (ferrule type, supplied) to maintain performance. This fabrication requires the optional crimping tool (type: CRIMPFOX 10S).

How to attach ferrule-type lug


Vinyl sheath
L
Core
0.5 to 1 mm
Rod terminal (ferrule type):
The core must protrude 0.5 to 1 mm
past the rod terminal.
Rod terminal (ferrule type):
After attaching the rod terminal, use the optional
crimping tool CRIMPFOX 10S to crimp.

Ferrule-type lug	Length of "L"
AI 1.5-6 BK (BLK)	6 mm
AI 0.34-6 TQ (BLU)	
AI 0.75-6 GY (GREY)	
AI 1-6 RD (RED)	
AI 0.14-8 GY(GREY)	8 mm

For the relations between the connectors and rod terminals, see page AP-2. Also, the stickers attached on the reverse side of the covers show the detailed connections.

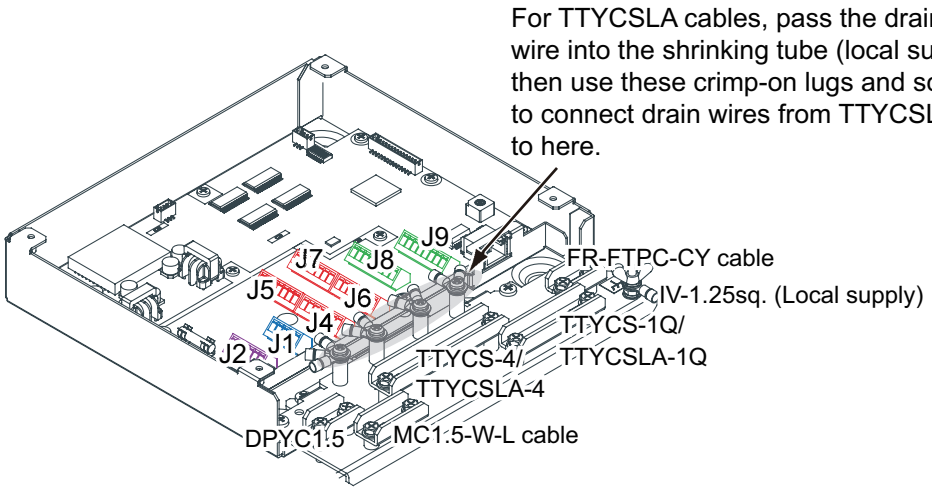
Use the MC1.5-W cable between the sensor adapters. Attach the cables to the applicable pins.

Pin No.	Cable color	Signal
1	Red	24V_OUT or 24V_IN
2	Black	24V_GND
3	White	MODBUS-A
4	Blue	MODBUS-B
5	Gray	GND

Note: The total length of the MC1.5-W cables should be less than 6 m to prevent malfunction.

2.2.1 MC-3000S connections

Unfasten four screws to remove the cover, pass the cables through the clamps and attach the cables to respective connectors. The shield part of the cable (or drain wire) must be fastened by (connected to) the clamp.



Note: Fasten the cable shield with the cable clamp.

How to set NC/NO output (J2)

The POWER FAIL signal on the connector J2 can be set to NC (normal close) output or NO (normal open) output as shown in the table below.

Pin#	Signal name	In/Out	Description	NO	NC
1	24V_IN	-	24 VDC	DPYC-1.5	
2	24V_GND	-	GND (24 VDC)		
3	PWR_FAIL_A	Out	Power fail output	TTYCS(LA)-1	No connection
4	PWR_FAIL_COM	Out	Power fail output		TTYCS(LA)-1
5	PWR_FAIL_B	Out	Power fail output	No connection	

How to set input specification (J4 to J9)

For connectors J4 to J7, the connections are different depending on the input specifications as shown below. Also, for J8 and J9, the signals which are input/output are shown.

Connector J4

Pin #	Signal name	In/Out	Description	IEC61162-2	IEC61162-1	Modbus*
1	TD1-A	Out	Serial CH1, output IEC61162-1/2/modbus	TTYCS(LA)-4	TTYCS(LA)-4	TTYCS(LA)-4
2	TD1-B	Out	Serial CH1, output IEC61162-1/2/modbus			
3	RD1-A	In	Serial CH1, input IEC61162-2/modbus		No connection	No connection
4	RD1-B	In	Serial CH1, input IEC61162-2/modbus			
5	ISOGND1	-	Isolation, GND (CH1)			
6	RD1-H	In	Serial CH1, input IEC61162-1	No connection	TTYCS(LA)-4	
7	RD1-C	In	Serial CH1, input IEC61162-1			

*: Set the jumpers J20/J21 to Modbus.

Connector J5

Pin #	Signal name	In/Out	Description	IEC61162-2	IEC61162-1	Modbus*
1	TD2-A	Out	Serial CH2, output IEC61162-1/2/modbus	TTYCS(LA)-4	TTYCS(LA)-4	TTYCS(LA)-4
2	TD2-B	Out	Serial CH2, output IEC61162-1/2/modbus			
3	RD2-A	In	Serial CH2, input IEC61162-2/modbus		No connection	No connection
4	RD2-B	In	Serial CH2, input IEC61162-2/modbus			
5	ISOGND2	-	Isolation, GND (CH2)			
6	RD2-H	In	Serial CH2, input IEC61162-1	No connection	TTYCS(LA)-4	
7	RD2-C	In	Serial CH2, input IEC61162-1			

*: Set the jumpers J20/J21 to Modbus.

Connector J6

Pin #	Signal name	In/Out	Description	IEC61162-2	IEC61162-1
1	TD3-A	Out	Serial CH3, output IEC61162-1/2	TTYCS(LA)-4	TTYCS(LA)-4
2	TD3-B	Out	Serial CH3, output IEC61162-1/2		
3	RD3-A	In	Serial CH3, input IEC61162-2		No connection
4	RD3-B	In	Serial CH3, input IEC61162-2		
5	ISOGND3	-	Isolation, GND (CH3)		
6	RD3-H	In	Serial CH3, input IEC61162-1	No connection	TTYCS(LA)-4
7	RD3-C	In	Serial CH3, input IEC61162-1		

Connector J7

Pin #	Signal name	In/Out	Description	IEC61162-2	IEC61162-1
1	TD4-A	Out	Serial CH4, output IEC61162-1/2	TTYCS(LA)-4	TTYCS(LA)-4
2	TD4-B	Out	Serial CH4, output IEC61162-1/2		
3	RD4-A	In	Serial CH4, input IEC61162-2		No connection
4	RD4-B	In	Serial CH4, input IEC61162-2		
5	ISOGND4	-	Isolation, GND (CH4)		
6	RD4-H	In	Serial CH4, input IEC61162-1	No connection	TTYCS(LA)-4
7	RD4-C	In	Serial CH4, input IEC61162-1		

Connector J8

Pin#	Signal name	In/Out	Description	Used cable
1	TD5-A	Out	Serial CH5, output IEC61162-1	TTYCS-1Q or TTYCSLA-1Q
2	TD5-B	Out	Serial CH5, output IEC61162-1	
3	RD5-H	In	Serial CH5, input IEC61162-1	
4	RD5-C	In	Serial CH5, input IEC61162-1	
5	TD6-A	Out	Serial CH6, output IEC61162-1	
6	TD6-B	Out	Serial CH6, output IEC61162-1	
7	RD6-H	In	Serial CH6, input IEC61162-1	
8	RD6-C	In	Serial CH6, input IEC61162-1	

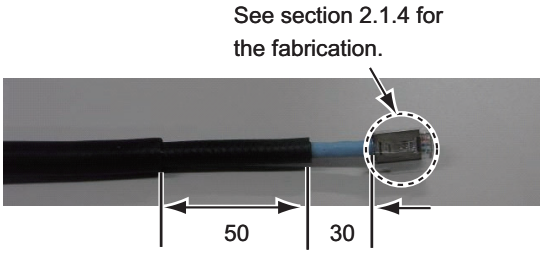
Connector J9

Pin#	Signal name	In/Out	Description	Used cable
1	TD7-A	Out	Serial CH7, output IEC61162-1	TTYCS-1Q or TTYCSLA-1Q
2	TD7-B	Out	Serial CH7, output IEC61162-1	
3	RD7-H	In	Serial CH7, input IEC61162-1	
4	RD7-C	In	Serial CH7, input IEC61162-1	
5	TD8-A	Out	Serial CH8, output IEC61162-1	
6	TD8-B	Out	Serial CH8, output IEC61162-1	
7	RD8-H	In	Serial CH8, input IEC61162-1	
8	RD8-C	In	Serial CH8, input IEC61162-1	

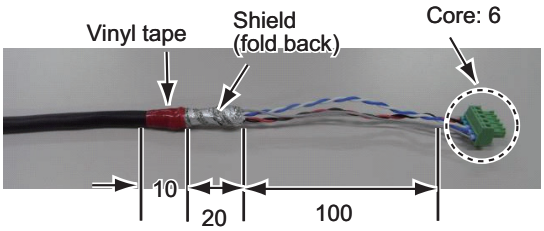
2.2.2 MC-3000S connection fabrications

Fabricate the cables to be connected to the MC-3000S referring to the figure below.

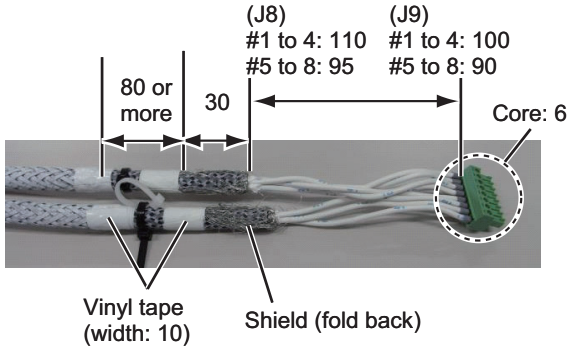
LAN cable (FR-FTPC-CY)



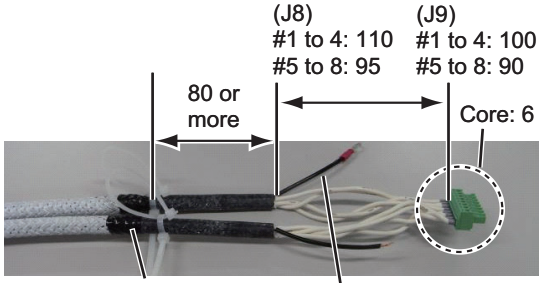
MC1.5-W-L600/1000/2000/3000 cable



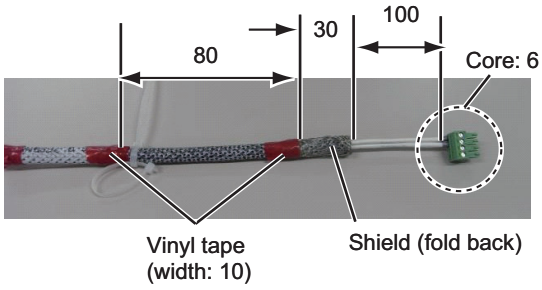
TTYCS-1Q cable



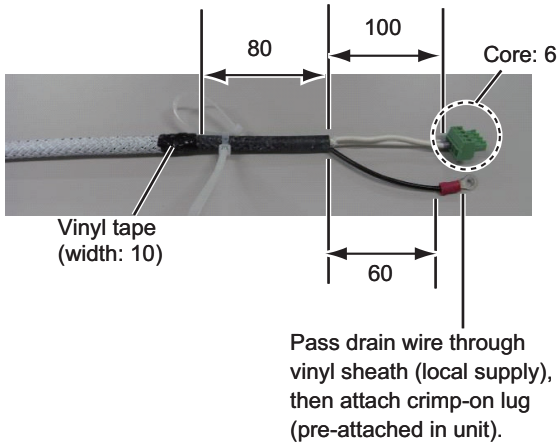
TTYCSLA-1Q cable



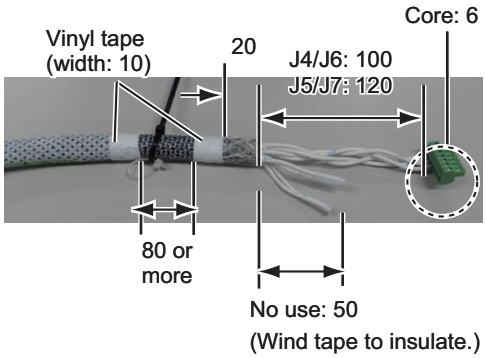
TTYCS-1 cable



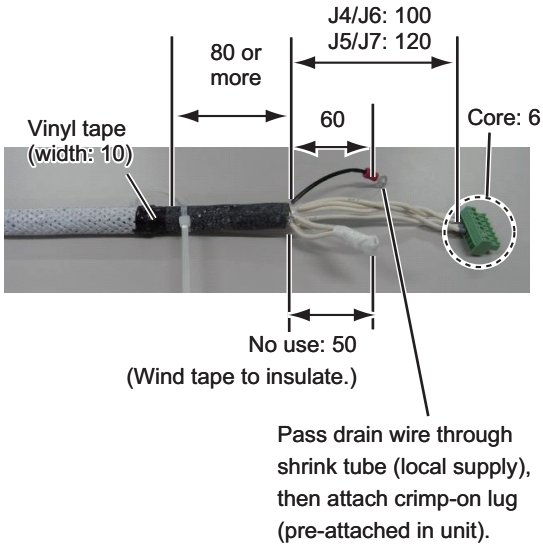
TTYCSLA-1 cable



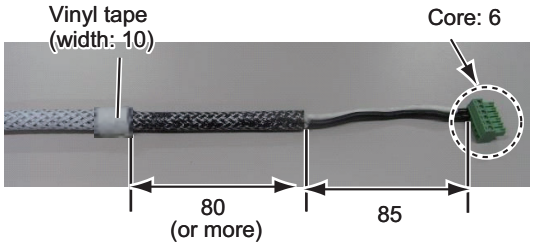
TTYCS-4 cable



TTYCSLA-4 cable

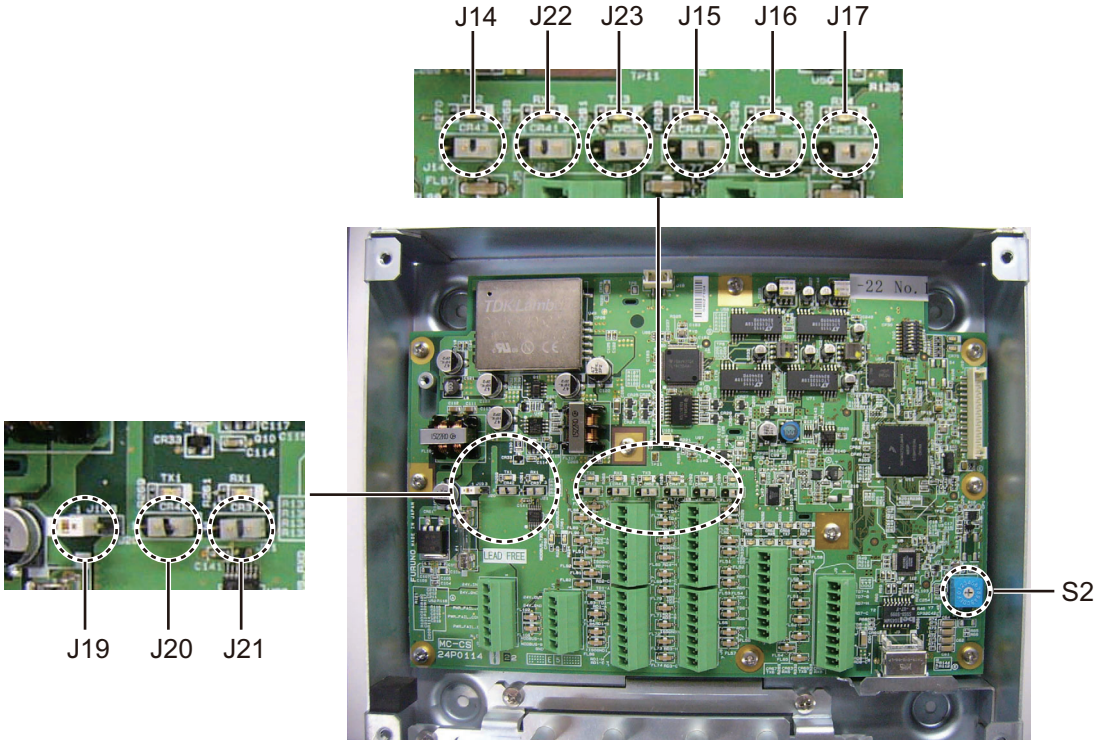


DPYC-1.5 cable



2.2.3 MC-3000S Jumper and MODBUS settings

Set the jumper blocks in the MC-CS Board (24P0114) referring to the tables that follow.



MC-CS Board (24P0114)

Setting MODBUS addresses: Use the rotary switch (S2) to set the Modbus address when setting connectors J4/J5 to Modbus. The Modbus address set at J4/J5 in the network is not used. When setting J4/J5 to IEC61162-1/2, use the default setting ("0").

Setting termination resistors on the Jumper block:
Use the jumper block J19 to set the termination resistor on/off for the MODBUS communication on the connector J1. For the first and last sensor adapter in a series, their termination resistors should be set to ON. Use the MC-CS Board with the default setting because it becomes the "first" adapter in a series.

Jumper block J19		Connector J1
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Set the jumper blocks J14 through J17 to turn the termination resistors on connectors J4 through J7 respectively.

(Termination resistor ON)

- When setting the starting/ending terminal for the multipoint, or the multipoint is not connected (CH1 to 4).
- When setting the starting/ending terminal for Modbus (CH1, CH2)

(Terminal resistor OFF)

- When setting the terminal other than starting/ending for the multipoint (CH1 to 4).
- When setting the terminal other than starting/ending for Modbus (CH1/CH2)

Jumper block J14		Connector J4 (CH1)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Jumper block J15		Connector J5 (CH2)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Jumper block J16		Connector J6 (CH3)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Jumper block J17		Connector J7 (CH4)
1-2	SHORT	Termination resistor: ON (default setting)
2-3	OPEN	
1-2	OPEN	Termination resistor: OFF
2-3	SHORT	

Choosing the communication type

Set the jumper blocks J20 and J21 to choose the communication type (IEC-61162-1/2 or MODBUS) of the connector J4 (CH1).
The setting of the jumper block JP20 and JP21 must be identical.

Jumper block J20/J21		Communication type of J4 (between RD1 and TD1)
1-2	OPEN	IEC-61162-1/2 (default setting)
2-3	SHORT	
1-2	SHORT	MODBUS (The setting of J14 is different depending on the unit position (starting/ending terminal).)
2-3	OPEN	

The jumper blocks J22 and J23 are used to set the communication type of the connector J5 (CH2).

Jumper block J22/J23		Communication type of J5 (between RD2 and TD2)
1-2	OPEN	IEC-61162-1/2 (default setting)
2-3	SHORT	
1-2	SHORT	MODBUS (The setting of J14 is different depending on the unit position (starting/ending terminal).)
2-3	OPEN	

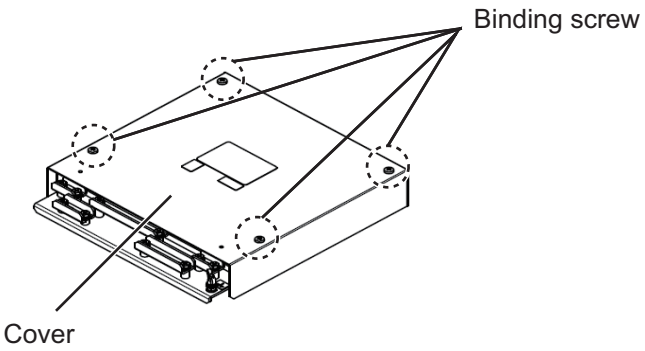
2.2.4 Waterproof case packing for MC-3000S (optional)

The optional kit OP24-28 protects the connectors on the MC-3000C to waterproofing standard IPX2.

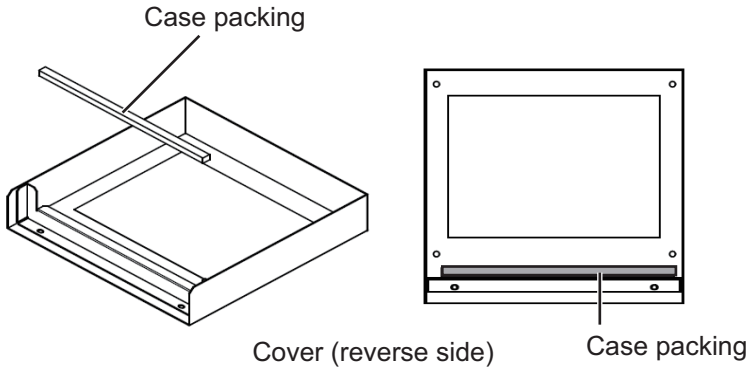
Case packing (type: OP24-28, code no.: 001-169-970)

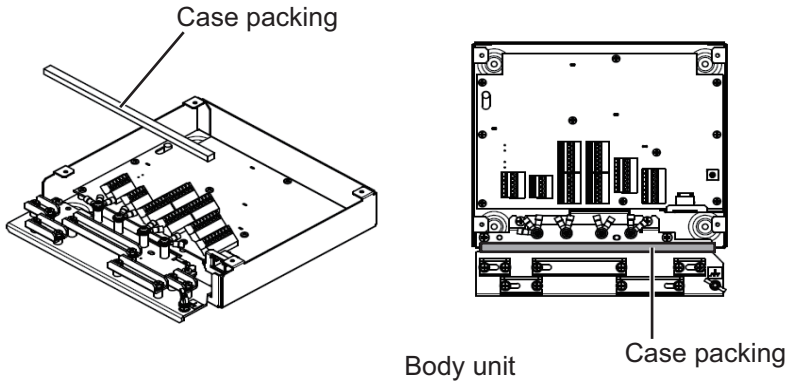
Name	Type	Code No.	Qty	Remarks
Case packing (serial)	21-014-2051	100-367-880-10	2	For MC-3000S

1. Unfasten four binding screws to remove the cover from the adapter.



2. Peel the paper from the case packing, then attach the case packing to the reverse side of the cover and the body unit as shown below.

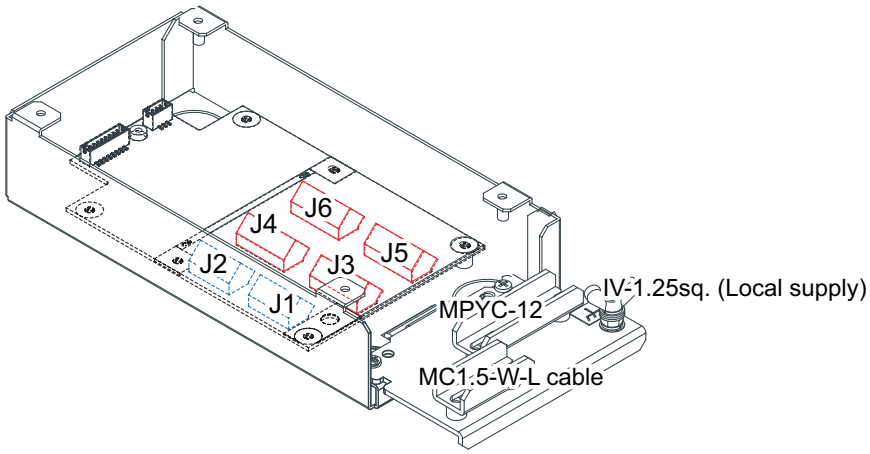




3. Attach the cover to the MC-3000S body unit.

2.2.5 MC-3020/3030D connections

- MC-3020D: Inputs digital signal (8ch contact input). Contact or voltage input is selectable (contact input requires jumper pins).
- MC-3030D: Outputs digital signal (8ch, normal open/close).



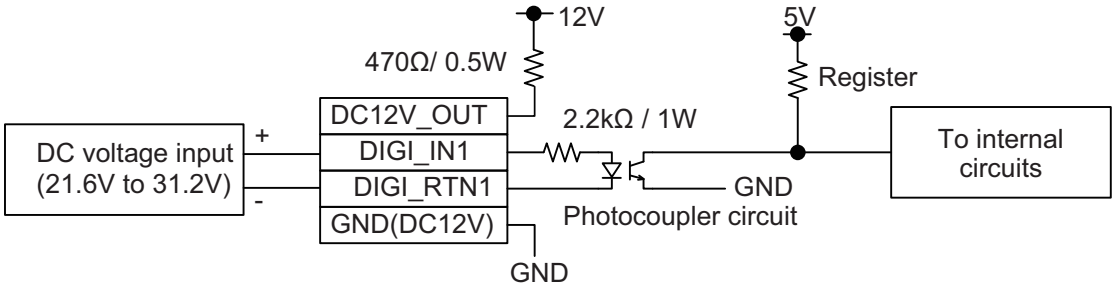
Note: Fasten the cable shield with the cable clamp.

MC-3020D/3030D

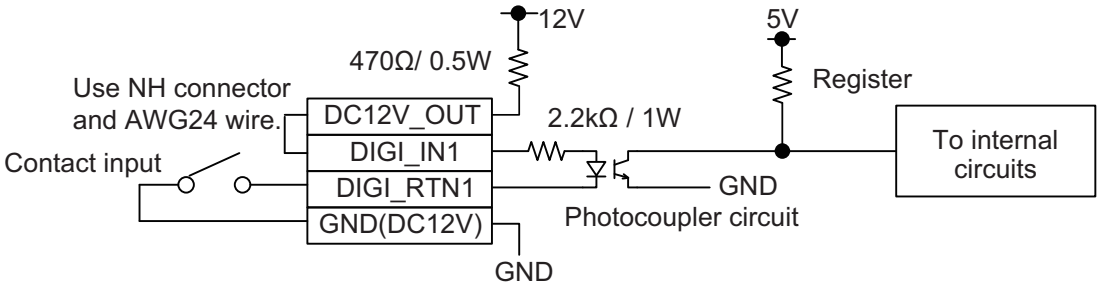
How to set ACK input (MC-3020D)

Use the connectors J3 to J6 on the MC-DIN Board (24P0116) to set the ACK input for ACK1 to ACK8 as shown below.

- Input circuit for voltage input



- Input circuit for contact input



Note: The input must not exceed the range of the input voltage, to prevent malfunction.
-Setting for voltage input: 21.6 V to 31.2 V
-Setting for contact input: Voltage cannot be input (contact signal only).

Connector J3

Pin #	Signal name	In/ Out	Remarks	ACK1 contact	ACK voltage	ACK2 contact	ACK2 voltage
1	DC12V_OUT	Out	ACK1 In	Pin #1-#2: short	No connection	Depending on ACK1 input	
2	DIGI_IN1	In			MPYC-12		
3	DIGI_RTN1	Out		MPYC-12			
4	GND (DC12V)	In			No connection		
5	DC12V_OUT	Out	ACK2 In	Depending on ACK2 input		Pin #1-#2: short	No connection
6	DIGI_IN2	In					MPYC-12
7	DIGI_RTN2	Out				MPYC-12	
8	GND (DC12V)	In					No connection

Connector J4

Pin #	Signal name	In/ Out	Remarks	ACK3 contact	ACK3 voltage	ACK4 contact	ACK4 voltage
1	DC12V_OUT	Out	ACK3 In	Pin#1-#2: short	No connection	Depending on ACK3 input-	
2	DIGI_IN3	In			MPYC-12		
3	DIGI_RTN3	Out		MPYC-12			
4	GND (DC12V)	In			No connection		
5	DC12V_OUT	Out	ACK4 In	Depending on ACK4 input		Pin #1-#2: short	No connection
6	DIGI_IN4	In					MPYC-12
7	DIGI_RTN4	Out				MPYC-12	
8	GND (DC12V)	In					No connection

Connector J5

Pin #	Signal name	In/ Out	Remarks	ACK5 contact	ACK5 voltage	ACK6 contact	ACK6 voltage
1	DC12V_OUT	Out	ACK5 In	Pin #1-#2: short	No connection	Depending on ACK5 input	
2	DIGI_IN5	In			MPYC-12		
3	DIGI_RTN5	Out		MPYC-12			
4	GND (DC12V)	In			No connection		
5	DC12V_OUT	Out	ACK6 In	Depending on ACK6 input-		Pin #1-#2: short	No connection
6	DIGI_IN6	In					MPYC-12
7	DIGI_RTN6	Out				MPYC-12	
8	GND (DC12V)	In					NO connection

Connector J6

Pin #	Signal name	In/ Out	Remarks	ACK7 contact	ACK7 voltage	ACK8 contact	ACK8 voltage
1	DC12V_OUT	Out	ACK1 In	Pin #1-#2: short	No connection	Depending on ACK7 input	
2	DIGI_IN7	In			MPYC-12		
3	DIGI_RTN7	Out		MPYC-12			
4	GND (DC12V)	In			No connection		
5	DC12V_OUT	Out	ACK2 In	Depending on ACK8 input		Pin #1-#2: short	No connection
6	DIGI_IN8	In					MPYC-12
7	DIGI_RTN8	Out				MPYC-12	
8	GND (DC12V)	In					NO connection

How to set alarm output (MC-3030D)

Use the connector J3 to J6 on the MC_OUT Board (24P0117) to select NC (normal close) or NO (normal open) for alarm output 1 to 8.

Connector J3

Pin #	Signal name	In/ Out	Remarks	Alarm1 NO Out	Alarm1 NC Out	Alarm2 NO Out	Alarm2 NC Out
1	A1	Out	Alarm1 Out	MPYC-12	No connection	-	
2	COM1				MPYC-12		
3	B1			No connection			
4	A2		Alarm2 Out	-		MPYC-12	No connection
5	COM2						MPYC-12
6	B2					No connection	

Connector J4

Pin #	Signal name	In/ Out	Remarks	Alarm3 NO Out	Alarm3 NC Out	Alarm4 NO Out	Alarm4 NC Out
1	A3	Out	Alarm3 Out	MPYC-12	No connection	-	
2	COM3				MPYC-12		
3	B3			No connection			
4	A4		Alarm4 Out	-		MPYC-12	No connection
5	COM4						MPYC-12
6	B4					No connection	

Connector J5

Pin #	Signal name	In/ Out	Remarks	Alarm5 NO Out	Alarm5 NC Out	Alarm6 NO Out	Alarm6 NC Out
1	A5	Out	Alarm5 Out	MPYC-12	No connection	-	
2	COM5				MPYC-12		
3	B5			No connection			
4	A6		Alarm5 Out	-		MPYC-12	No connection
5	COM6						MPYC-12
6	B6					No connection	

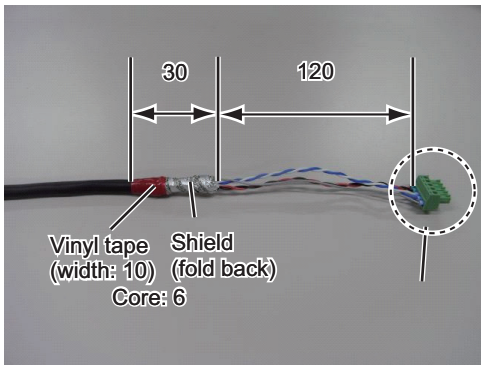
Connector J6

Pin #	Signal name	In/ Out	Remarks	Alarm7 NO Out	Alarm7 NC Out	Alarm8 NO Out	Alarm8 NC Out
1	A7	Out	Alarm7 Out	MPYC-12	No connection	-	
2	COM7				MPYC-12		
3	B7			No connection			
4	A8		Alarm8 Out	-		MPYC-12	No connection
5	COM8						MPYC-12
6	B8					No connection	

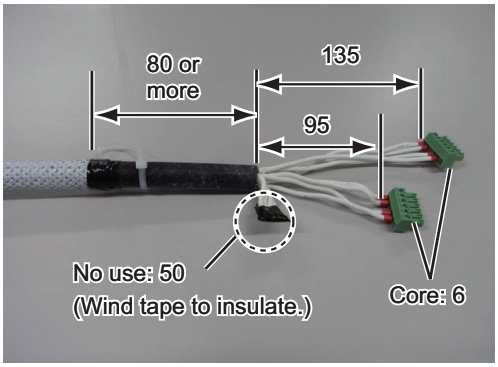
2.2.6 Cable fabrication for MC-3020D/3030D connections

Using the figures below for reference, fabricate the cables to be connected to the MC-3020D/3030D.

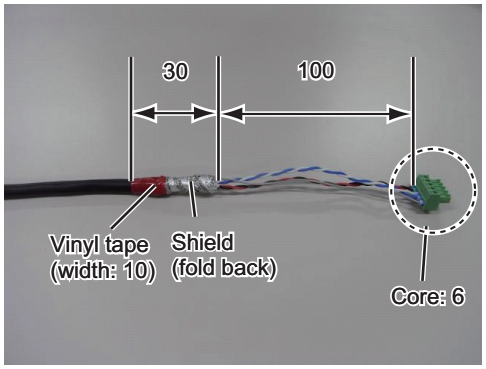
MC1.5-W-L600/1000/2000/3000 cable (Input)



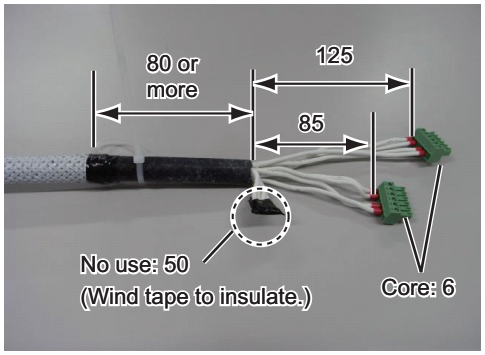
MPYC-12 cable (MC-3020D)



MC1.5-W-L600/1000/2000/3000 cable (Output)



MPYC-12 cable (MC-3030D)

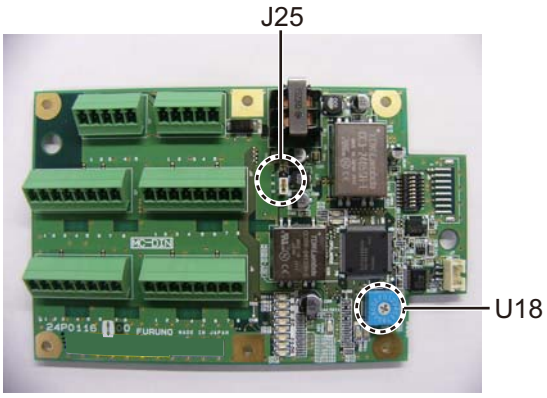


2.2.7 How to set jumper blocks in the sensor adapters

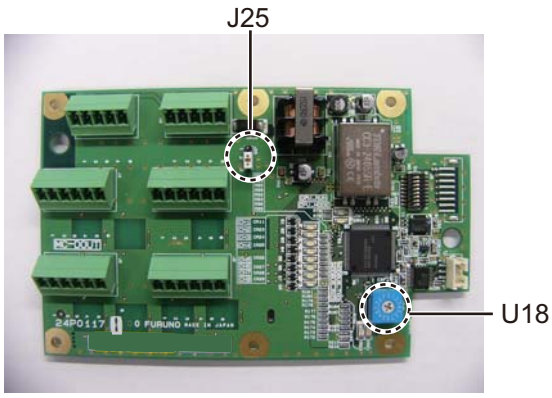
MC-3020D/3030D

This paragraph shows how to set the MC-DIN Board (24P0116, for MC-3020D) and MC-DOUT Board (24P0117, for MC-3030D).

Setting MODBUS addresses: Use the rotary switch (U18) to set the MODBUS address with a digit of number from "0". When multiple sensor adapters are connected to the MC-3000S, the same number cannot be used among them. (It is allowed to use the same number between the MC-3000S and a sensor adapter.)



MC-DIN Board (24P0116)



MC-OUT Board (24P0117)

Setting termination resistors on the Jumper block

Use the jumper block J25 to set the termination resistor on/off for the MODBUS communication on the connector J1. For the first and last sensor adapter in a series, their termination resistors should be set to ON. If not, communication between sensor adapters is not possible.

Jumper block J25		Connector J1
1-2	OPEN	Termination resistor: OFF (default setting)
2-3	SHORT	
1-2	SHORT	Termination resistor: ON
2-3	OPEN	

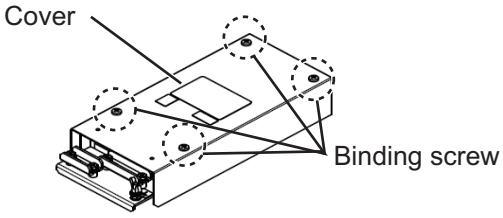
2.2.8 MC-3020D/3030D Waterproof case packing OP24-29 (Optional)

The optional kit OP24-29 protects the connectors on the MC-3020D/3030D to waterproofing standard IPX2.

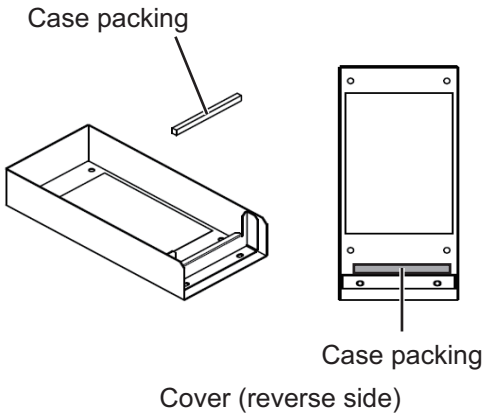
Case packing (type: OP24-29, code no.: 001-169-970)

Name	Type	Code No.	Qty	Remarks
Case packing (analog)	21-014-2052-2	100-367-961-10	2	MC-3020D/3030D

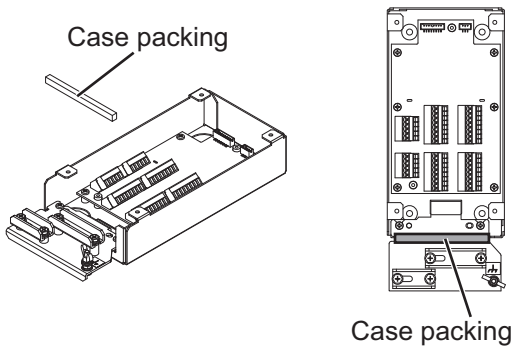
1. Unfasten four binding screws to remove the cover from the adapter.



2. Peel the paper from the case packing, then attach the case packing to the reverse side of the cover and the body unit as shown below.

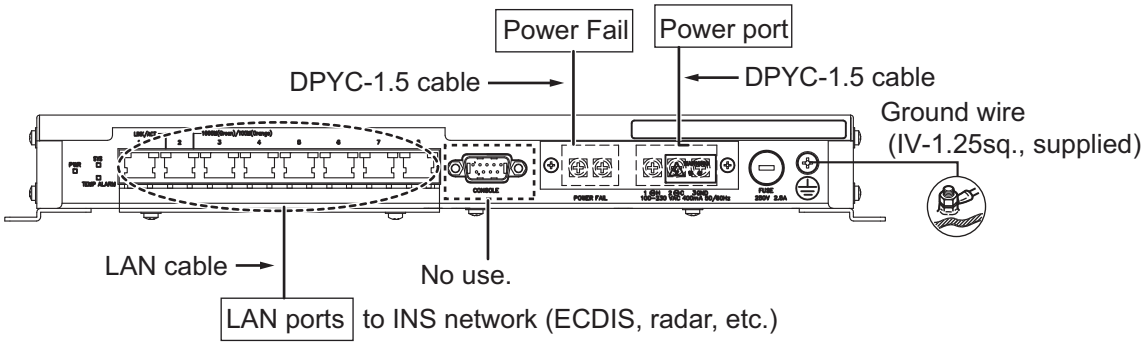


3. Attach the cover to the MC-3020D/3030D chassis.

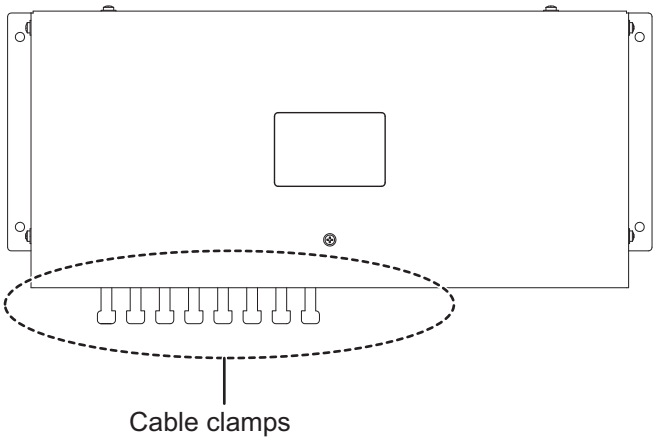


2.3 Intelligent HUB HUB-3000 (Optional)

Fix any LAN cables connected to the HUB-3000 to their respective cable clamps using cable ties (supplied).

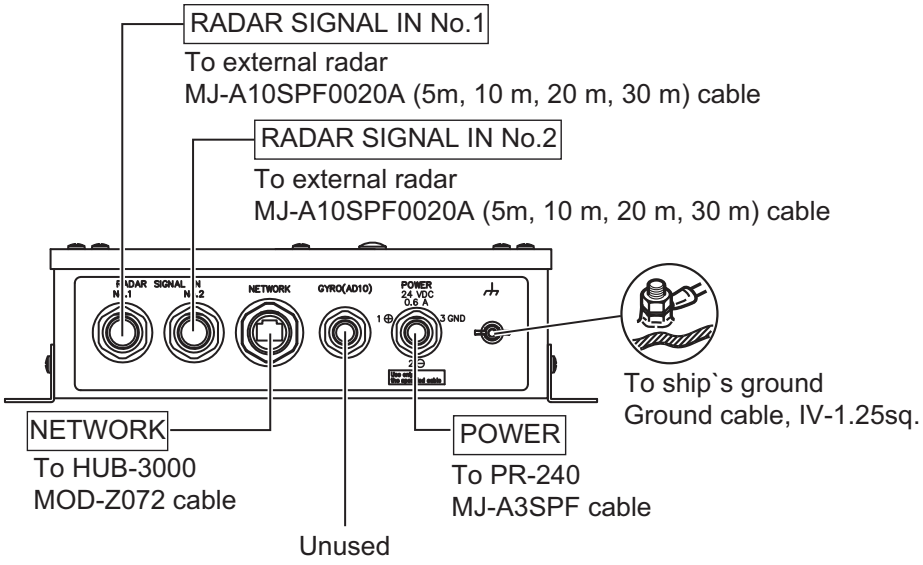


Attach the LAN cap (supplied) to the unused connector holes to provide waterproofing standard IPX2.



2.4 Radar Connection Box RCB-002 (Optional)

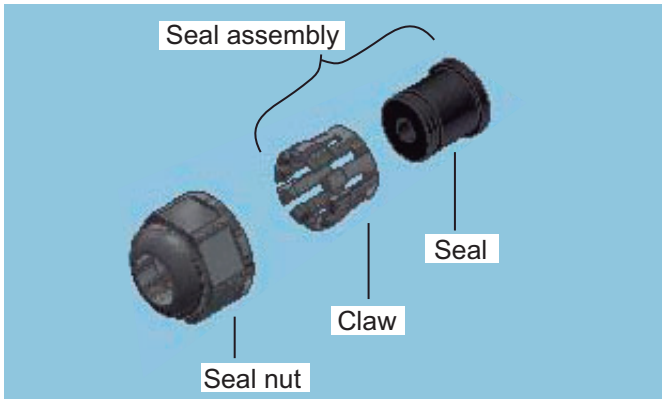
The RCB-002 is capable of connecting the FMD-3100 with up to two external radar systems. Referring to the figure and table below, connect the respective equipment to the RCB-002.



Connecting LAN cables

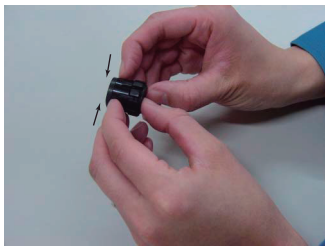
When connecting LAN cables (MOD-Z072) to the RCB-002, use the following procedure.

1. Unfasten and remove the sealing nut from the NETWORK port on the RCB-002, then remove the seal assembly. See the figure below for reference.



2. Dismantle the seal assembly as shown below.

Dismantling the seal assembly

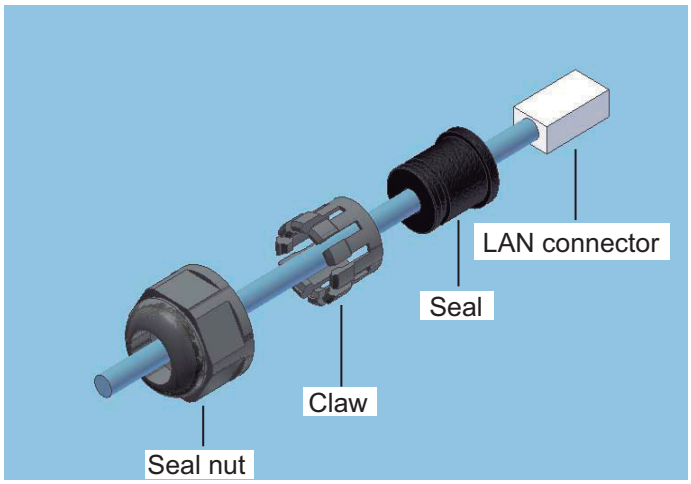


STEP 1:
Hold the fat end of the seal assembly with both thumbs while placing the index fingernails between the seal and the claw.

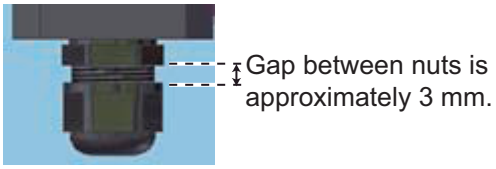
Use caution to avoid injury.

STEP 2:
Using the thumbs, gently push the seal out of the claw.

3. Referring to the figure below, pass the LAN cable through the seal nut, then the claw and finally the seal.



4. Connect the LAN cable to the connector.
5. Join the claw and seal to form the seal assembly, then firmly join the seal assembly to the LAN connector.
6. Fasten the seal nut and secure the cable. Continue to fasten the nut until the space between the two nuts is approximately 3 mm. See the figure below for reference.



2.4.1 Jumper settings for RCB-002

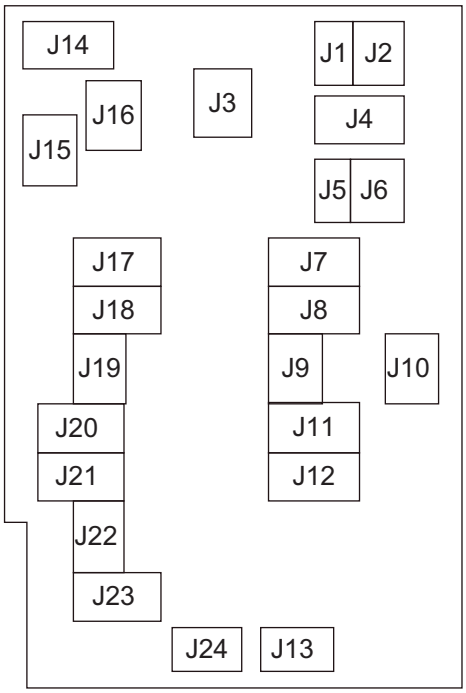
The RCB-002 is compatible with the following radars.

Maker	Model	Maker	Model
FURUNO*	• FAR-14×7 series • FAR-2××7 series • FAR-2××5 series • Model 1835	Japan Radio Company (JRC)	JMA-9100 series
		Tokyo Keiki Inc.	BR-3440 series

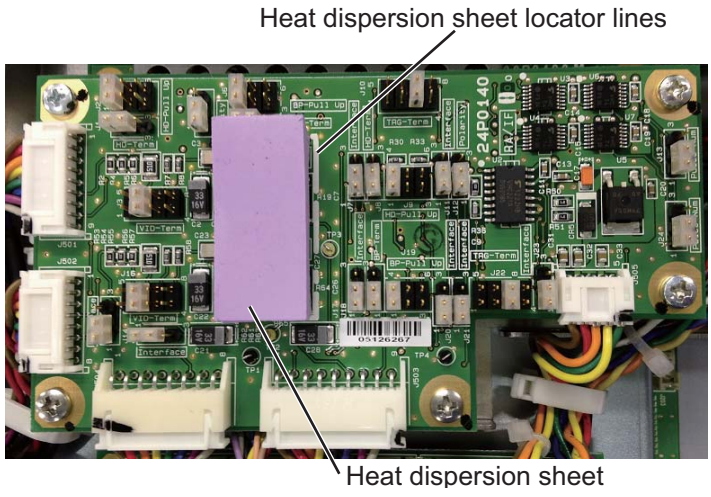
*: FURUNO radars are only compatible with the CH2 (RADAR SIGNAL IN NO.2 port).

Change the jumper settings on the RA/IF board (24P0140) according to the radar to be connected, referring the tables on the next page.

Jumper locations on the RA/IF board (24P0140)



Note: According to the shipment time, the heat dispersion sheet may be attached to the RA/IF board (24P0140). If the heat dispersion sheet is attached, it may come loose when removing the RCB-002 cover. Before closing the cover, make sure the dispersion sheet is in the location shown below. If the sheet is loose, align it with the locator lines printed on the board.



CH1 settings (RADAR SIGNAL IN NO.1)

Using the table below for reference, change the jumper settings to suit the appropriate radar connection. Use the figure on the previous page for jumper locations.

Jumper	Radar to be connected	
	JMA-9100 series	BR-3440 series
J1	#2-3: short	
J2	#3-6: short	
J3	#2-6: short	#1-5: short
J4	#1-2: short	
J5	#2-3: short	
J6	#3-6: short	
J10	#3-7: short	#2-6: short
J13	#1-2: short	#2-3: short

CH2 settings (RADAR SIGNAL IN NO.2)

Using the table below for reference, change the jumper settings to suit the appropriate radar connection. Use the figure on the previous page for jumper locations.

Jumper	Radar to be connected		
	FURUNO radars	JMA-9100 series	BR-3440 series
J7	#2-3: short	#1-2: short	
J8	#1-2: short	#2-3: short	
J9	#1-4: short	#3-6: short	
J11	#2-3: short	#1-2: short	
J12	#1-2: short	#1-2: short	
J14	#2-3: short	#1-2: short	
J15	#2-3: short	#1-2: short	
J16	#2-6: short	#2-6: short	#1-5: short
J17	#2-3: short	#1-2: short	
J18	#1-2: short	#2-3: short	
J19	#1-4: short	#3-6: short	
J20	#2-3: short	#1-2: short	
J21	#2-3: short	#1-2: short	
J22	#3-7: short	#3-7: short	#2-6: short
J23	#2-3: short	#1-2: short	
J24	#1-2: short	#1-2: short	#2-3: short

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APPENDIX 1 JIS CABLE GUIDE

Cables listed in the manual are usually shown as Japanese Industrial Standard (JIS). Use the following guide to locate an equivalent cable locally.

JIS cable names may have up to 6 alphabetical characters, followed by a dash and a numerical value (example: DPYC-2.5).
For core types D and T, the numerical designation indicates the *cross-sectional Area (mm^2)* of the core wire(s) in the cable.
For core types M and TT, the numerical designation indicates the *number of core wires* in the cable.

1. Core Type

D: Double core power line
T: Triple core power line
M: Multi core
TT: Twisted pair communications (1Q=quad cable)

2. Insulation Type

P: Ethylene Propylene Rubber

3. Sheath Type

Y: PVC (Vinyl)

4. Armor Type

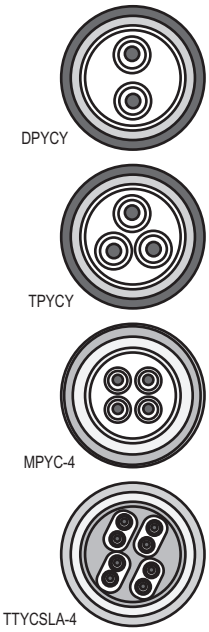
C: Steel

5. Sheath Type

Y: Anticorrosive vinyl sheath

6. Shielding Type

S: All cores in one sheath
-S: Indivisually sheathed cores
SLA: All cores in one shield, plastic tape w/aluminum tape
-SLA: Individually shielded cores, plastic tape w/aluminum tape



1 2 3 4 5 6
EX: TTYCYSLA - 4
Designation type ┘ Core Area (mm^2) ┘

1 2 3 4
MPYC - 4
Designation type ┘ # of cores ┘

The following reference table lists gives the measurements of JIS cables commonly used with Furuno products:

Type	Core Area	Core Diameter	Cable Diameter	Type	Core Area	Core Diameter	Cable Diameter
DPYC-1.5	1.5mm^2	1.56mm	11.7mm	TTYCS-1	0.75mm^2	1.11mm	10.1mm
DPYC-2.5	2.5mm^2	2.01mm	12.8mm	TTYCS-1T	0.75mm^2	1.11mm	10.6mm
DPYC-4	4.0mm^2	2.55mm	13.9mm	TTYCS-1Q	0.75mm^2	1.11mm	11.3mm
DPYC-6	6.0mm^2	3.12mm	15.2mm	TTYCS-4	0.75mm^2	1.11mm	16.3mm
DPYC-10	10.0mm^2	4.05mm	17.1mm	TTYCSLA-1	0.75mm^2	1.11mm	9.4mm
DPYCY-1.5	1.5mm^2	1.56mm	13.7mm	TTYCSLA-1T	0.75mm^2	1.11mm	10.1mm
DPYCY-2.5	2.5mm^2	2.01mm	14.8mm	TTYCSLA-1Q	0.75mm^2	1.11mm	10.8mm
DPYCY-4	4.0mm^2	2.55mm	15.9mm	TTYCSLA-4	0.75mm^2	1.11mm	15.7mm
MPYC-2	1.0mm^2	1.29mm	10.0mm	TTYCY-1	0.75mm^2	1.11mm	11.0mm
MPYC-4	1.0mm^2	1.29mm	11.2mm	TTYCY-1T	0.75mm^2	1.11mm	11.7mm
MPYC-7	1.0mm^2	1.29mm	13.2mm	TTYCY-1Q	0.75mm^2	1.11mm	12.6mm
MPYC-12	1.0mm^2	1.29mm	16.8mm	TTYCY-4	0.75mm^2	1.11mm	17.7mm
TPYC-1.5	1.5mm^2	1.56mm	12.5mm	TTYCY-4S	0.75mm^2	1.11mm	21.1mm
TPYC-2.5	2.5mm^2	2.01mm	13.5mm	TTYCY-4SLA	0.75mm^2	1.11mm	19.5mm
TPYC-4	4.0mm^2	2.55mm	14.7mm	TTYCYS-1	0.75mm^2	1.11mm	12.1mm
TPYCY-1.5	1.5mm^2	1.56mm	14.5mm	TTYCYS-4	0.75mm^2	1.11mm	18.5mm
TPYCY-2.5	2.5mm^2	2.01mm	15.5mm	TTYCYSLA-1	0.75mm^2	1.11mm	11.2mm
TPYCY-4	4.0mm^2	2.55mm	16.9mm	TTYCYSLA-4	0.75mm^2	1.11mm	17.9mm

APPENDIX 2 ROD TERMINALS

MC-3000S, MC-CS Board (24P0114)

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J1	1	24V_VOUT	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J2	1	24V_IN	AI 1.5-6 BK (black)	DPYC-1.5
	2	24V_GND		
	3	PWR_FAIL-A	AI 0.75-6 GY (Gray)	TTYCS-4 TTYCSLA-4
	4	PWR_FAIL-COM		
	5	PWR_FAIL-B		
	6	NC	-	-

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J4	1	TD1-A	AI 0.75-6 GY (Gray)	TTYCS-4 TTYCSLA-4
	2	TD1-B		
	3	RD1-A		
	4	RD1-B		
	5	ISOGND1		
	6	RD1-H		
	7	RD1-C		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J5	1	TD2-A	AI 0.75-6 GY (gray)	TTYCS-4 TTYCSLA-4
	2	TD2-B		
	3	RD2-A		
	4	RD2-B		
	5	ISOGND2		
	6	RD2-H		
	7	RD2-C		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J6	1	TD3-A	AI 0.75-6 GY (gray)	TTYCS-4 TTYCSLA-4
	2	TD3-B		
	3	RD3-A		
	4	RD3-B		
	5	ISOGND3		
	6	RD3-H		
	7	RD3-C		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J7	1	TD4-A	AI 0.75-6 GY (gray)	TTYCS-4 TTYCSLA-4
	2	TD4-B		
	3	RD4-A		
	4	RD4-B		
	5	ISOGND4		
	6	RD4-H		
	7	RD4-C		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J8	1	TD5-A	AI 0.75-6 GY (gray)	TTYCS-1Q TTYCSLA-1Q
	2	TD5-B		
	3	RD5-H		
	4	RD5-C		
	5	TD6-A		TTYCS-1Q TTYCSLA-1Q
	6	TD6-B		
	7	RD6-H		
	8	RD6-C		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J9	1	TD7-A	AI 0.75-6 GY (gray)	TTYCS-1Q TTYCSLA-1Q
	2	TD7-B		
	3	RD7-H		
	4	RD7-C		
	5	TD8-A		TTYCS-1Q TTYCSLA-1Q
	6	TD8-B		
	7	RD8-H		
	8	RD8-C		

MC-3020D, MC-DIN Board (24P0116)

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J1	1	24V_IN	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J2	1	24V_OUT	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J3*	1	DV12V_OUT1	AI 1-6 RD (red)	MPYC-12
	2	DIGI_IN1		
	3	DIGI_RTN1		
	4	GND		
	5	DC12V_OUT2		
	6	DIGI_IN2		
	7	DIGI_RTN2		
	8	GND		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J4*	1	DV12V_OUT3	AI 1-6 RD (red)	MPYC-12
	2	DIGI_IN3		
	3	DIGI_RTN3		
	4	GND		
	5	DC12V_OUT4		
	6	DIGI_IN4		
	7	DIGI_RTN4		
	8	GND		

(*Continued on next page)*

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J5*	1	DV12V_OUT5	AI 1-6 RD (red)	MPYC-12
	2	DIGI_IN5		
	3	DIGI_RTN5		
	4	GND		
	5	DC12V_OUT6		
	6	DIGI_IN6		
	7	DIGI_RTN6		
	8	GND		

*: Pin #1 and 5: no cable connection. However the jumper connection is necessary between #1 and 2 and #5 and 6 depending on the input specification.

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J6*	1	DV12V_OUT7	AI 1-6 RD (red)	MPYC-12
	2	DIGI_IN7		
	3	DIGI_RTN7		
	4	GND		
	5	DC12V_OUT8		
	6	DIGI_IN8		
	7	DIGI_RTN8		
	8	GND		

*: Pin #1 and 5: no cable connection. However the jumper connection is necessary between #1 and 2 and #5 and 6 depending on the input specification.

MC-3030D, MC-DOUT Board (24P0117)

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J1	1	24V_IN	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J2	1	24V_OUT	AI 0.34-6 TQ (blue)	MC1.5-W-Lxxx
	2	24V_GND		
	3	MODBUS-A	AI 0.14-8 GY (gray)	
	4	MODBUS-B		
	5	GND		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J3	1	A1	AI 1-6 RD (red)	MPYC-12
	2	COM1		
	3	B1		
	4	A2		
	5	COM2		
	6	B2		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J4	1	A3	AI 1-6 RD (red)	MPYC-12
	2	COM3		
	3	B3		
	4	A4		
	5	COM4		
	6	B4		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J5	1	A5	AI 1-6 RD (red)	MPYC-12
	2	COM5		
	3	B5		
	4	A6		
	5	COM6		
	6	B6		

Connector #	Pin #	Signal name	Rod terminal to use	Connected cable
J6	1	A7	AI 1-6 RD (red)	MPYC-12
	2	COM7		
	3	B7		
	4	A8		
	5	COM8		
	6	B8		

APPENDIX 3 DIGITAL INTERFACE

Digital Interface

Input sentence

IEC61162-1/2	ABK, ALR, CUR, DBT, DPT, DTM, GGA, GLL, GNS, HDT, MTW, MWV, NRX, OSD, RMC, ROT, RSA, RSD, THS, TTM, VBW, VDM, VDO, VDR, VHW, VTG, XDR, ZDA
IEC61162-450	ABK, ALR, CUR, DBT, DPT, DTM, GGA, GLL, GNS, HDT, MTW, MWV, NRX, OSD, RMC, ROT, RSA, RSD, THS, TTM, VBW, VDM, VDO, VDR, VHW, VTG, XDR, ZDA

Output sentences

IEC61162-1/2	ABM, ACK, BBM, EVE, HTC, OSD, VBW, VSD, XTE
IEC61162-450	ABM, ACK, BBM, EVE, HTC, OSD, VBW, VSD, XTE

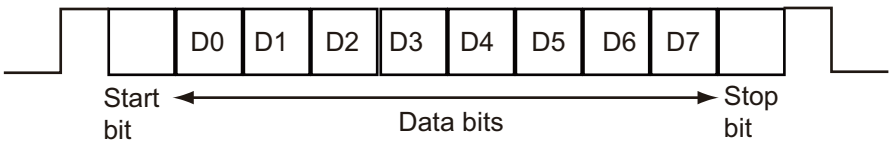
FURUNO proprietary output sentence

PFEC (pidat, pireq, llco, llmba, rminf, rmset, rmevt)

Data reception

Data is received in serial asynchronous form in accordance with the standard referenced in IEC 61162-2.

The following parameters are used:
Baud rate: 38,400 bps (HDT, THS, !AIVDM, !AIVDO, !AIABK, $AIALR). The baud rate of all other sentences is 4800 bps
Data bits: 8 (D7 = 0), Parity: none, Stop bits: 1



Data Sentences

Input sentences

ABK - UAIS Addressed and binary broadcast acknowledgement

$--ABK,xxxxxxxxx,x,x.x,x,x*hh<CR><LF>
1 2 3 4 5
1. MMSI of the addressed AIS unit (9 digits)
2. AIS channel of reception (No use)
3. Message ID (6, 8, 12, 14)
4. Message sequence number (0 - 9)
5. Type of acknowledgement (See below)
   1 = message was broadcast (6 or 12), but not ACK by addressed AIS unit
   2 = message could not be broadcast (quantity of encapsulated data exceeds five slots)
   3 = requested broadcast of message (8, 14 or 15) has been successfully completed
   4 = late reception of message (7 or 13) ACK that was addressed to this AIS unit (own ship and referenced a valid transaction
   5 = message has been read and acknowledged on a display unit.

ALR - Set alarm state

$--ALR,Hhmmss.ss,xxx,A,A,c—c*hh<CR><LF>
1 2 3 4 5
1. Time of alarm condition change, UTC (000000.00 - 235960.99)
2. Unique alarm number (identifier) at alarm source (000 - 999)
3. Alarm condition (A=threshold exceeded, V=not exceeded)
4. Alarm acknowledge state (A=acknowledged, V=not acknowledged)
5. Alarm description text (alphanumeric characters, max. 32)

CUR - Current

$--CUR,A,x,x.x,x.x,x.x,a,x.x,x.x,x.x,a,a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 1011
1. Validity of data (A=valid, V=not valid)
2. Data set number (0 - 9)
3. Layer number (0.0 - 3.0)
4. Current depth in meters (No use)
5. Current direction in degrees (0.00 - 360.00)
6. Direction reference in use (true or relative)
7. Current speed in knots (0.00 - 99.99)
8. Reference layer depth in meters (No use)
9. Heading (0 to 360.00)
10. Heading reference in use (true or magnetic)
11. Speed reference (B=Bottom track W=Water track P=Positioning system)

DBT - Depth below transducer

$--DBT,xxxx.x,f,xxxx.x,M,xxxx.x,F*hh<CR><LF>
1 2 3 4 5 6
1. Water depth (0.00-99999.99)
2. feet
3. Water depth (0.00-99999.99)
4. Meters
5. Water depth (0.00-99999.99)
6. Fathoms

DPT - Depth

$--DPT,x.x,x.x,x.x*hh<CR><LF>
1 2 3
1. Water depth relative to the transducer, meters (0.00-99999.99)
2. Offset from transducer, meters (No use)
3. Minimum range scale in use (No use)

DTM - Datum reference

$--DTM,ccc,a,x.x,a,x.x,a,x.x,ccc*hh<CR><LF>
1 2 3 4 5 6 7 8
1. Local datum (W84=WGS84 W72=WGS72 S85=SGS85, P90=PE90
2. Local datum subdivision code (NULL or one character)
3. Lat offset, min (0 - 59.99999)
4. N/S
5. Lon offset, min (0 - 59.99999)
6. E/W
7. Altitude offset, meters (No use)
8. Reference datum (W84=WGS84 W72=WGS72 S85=SGS85, P90=PE90)

GGA - Global positioning system fix data

$--GGA,hhmmss.ss,llll.lll,a,yyyyy.yyy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14
1. UTC of position (no use)
2. Latitude (0000.00000 - 9000.00000)
3. N/S
4. Longitude (0000.00000 - 18000.00000)
5. E/W
6. GPS quality indicator (1 - 8)
7. Number of satllite in use (No use)
8. Horizontal dilution of precision (0.0 - 999.9)
9. Antenna altitude above/below mean sealevel (No use)
10. Unit, m (No use)
11. Geoidal separation (No use)
12. Unit, m (No use)
13. Age of differential GPS data (0 - 999)
14. Differential reference station ID (No use)

GLL - Geographic position, latitude/longitude

$--GLL,llll.lll,a,yyyyy.yyy,a,hhmmss.ss,a,x*hh<CR><LF>
1 2 3 4 5 6 7
1. Latitude (0000.00000 - 9000.00000)
2. N/S
3. Longitude (0000.00000 - 18000.00000)
4. E/W
5. UTC of position (No use)
6. Status (A=data valid V=data invalid)
7. Mode indicator (A=Autonomous D=Differential E=Estimated M=Manual input S=Simulator)

GNS - GNSS fix data

$--GNS,hhmmss.ss,llll.lll,a,IIIII.III,a,c--c,xx,x.x,x.x,x.x,x.x,x.x,a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 1213

1. UTC of position (no use)
2. Latitude (0000.00000 - 9000.00000)
3. N/S
4. Longitude (0000.00000 - 18000.00000)
5. E/W
6. Mode indicator (P, R, D, F, A, E, M, S)
   N=No fix A=Autonomous D=Differential P=Precise R=Real Time Kinematic
   F=Float RTK E=Estimated Mode M=Manual Input Mode S=Simulator Mode
7. Total number of satellites in use (No use)
8. HDOP (0.00 - 999.99)
9. Antenna altitude, meters (-999.99 - 9999.99)
10. Geoidal separation (No use)
11. Age of differential data (0 - 99)
12. Differential reference station ID (No use)
13. Naivgational status indicator (S=Safe, C=Caution, U=Unsafe, V=Not valid)

HDT - Heading, true

$--HDT, xxx.x,T*hh<CR><LF>
1 2

1. Heading, degrees (0.00 to 360.00)
2. True (T)

MTW - Water temperature

$--MTW,x.x,C<CR><LF>
1

1. Water temperature, degrees C (-100.000 - 100.000)

MWV - Wind speed and angle

$--MWV,x.x,a,x.x,a,A*hh<CR><LF>
1 2 3 4 5

1. Wind angle, degrees (0.00 - 360.00)
2. Reference (R/T, R=Relative, T=Theoretical)
3. Wind speed (0.00 - 9999.99)
4. Wind speed units (K=km/h M=m/s N=nm)
5. Status (A)

NRX - Navtex received data

```
$--NRX,xxx,xxx,xx,aaxx,x,hhmmss.ss,xx,xx,xxxx,x.x,x.x, A,c--c*hh<CR><LF>
          1    2   3   4    5        6        7  8    9    10 11  12 13
```

1. Number of sentences (001 to 999)
2. Sentence number (001-999)
3. Sequential message ID (00 to 99)
4. Navtex message code (aaxx aa: AA to ZZ xx: 00 to 99)
5. Frequency table index (0 to 9, null)
6. UTC of receipt of message (No use)
7. Day (0 to 31, null)
8. Month (01 to 12, null)
9. Year (0000 to 9999, null)
10. Total number of characters in this series of NRX sentences (1 to 8000, null)
11. Total number of bad characters (0 to 8000, null)
12. Status indication (A=correct message, V=incorrect message; Null)
13. Message body (English alphanumeric characters)

OSD - Own ship data

```
$--OSD,x.x,A,x.x,a,x.x,a,x.x,x.x,a*hh<CR><LF>
           1 2 3 4  5 6 7  8  9
```

1. Heading, degrees true (0.00 - 359.99, null)
2. Heading status (A=data valid, V=data invalid)
3. Vessel course, degrees true (0.00 - 359.99, null)
4. Course reference (B/M/W/R/P, null)
   B=Bottom tracking log
   M=Manually entered
   W=Water referenced
   R=Radar tracking (of fixed target)
   P=Positioning system ground reference
5. Vessel speed (0.00 - 999.99, null)
6. Speed reference, B/M/W/R/P
7. Vessel set, degrees true, manually entered (0.00 - 359.99)
8. Vessel drift (speed), manually entered (0.00 - 99.99, null)
9. Speed units (N=Knots)

RMC - Recommended minimum specific GPS/TRANSIT datas

```
$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,ddmmyy,x.x,a,a,a*hh<CR><LF>
                  1      2  3  4     5      6  7  8       9       10 11 1213
```

1. UTC of position fix (000000 - 235959)
2. Status (A=data valid, V=navigation receiver warning)
3. Latitude (0000.00000 - 9000.0000)
4. N/S
5. Longitude (0000.00000 - 18000.0000)
6. E/W
7. Speed over ground, knots (0.00 - 99.94)
8. Course over ground, degrees true (0.0 - 360.0)
9. Date (010100 - 311299)
10. Magnetic variation, degrees E/W (0.00 - 180.0/NULL)
11. E/W
12. Mode indicator (A= Autonomous mode D= Differential mode S= Simulator
    F=Float RTK P=Precise R=Real time kinematic E=Estimated (DR) M=Manual
13. Navigational status indication (S=Safe C=Caution U=Unsafe V=Navigational status not valid)

ROT - Rate of turn

$--ROT,x.x,A*hh<CR><LF>
1 2

1. Rate of turn, deg/min, "-"=bow turns to port (-9999.9 - 9999.9)
2. Status (A=data valid, V=data invalid)

RSA - Rudder sensor angle

$--RSA,x.x,A,x.x,A*hh<CR><LF>
1 2 3 4

1. Starboard(or single) rudder sensor data (-180 - 180.0, NULL)
2. Starboard(or single) rudder sensor status (A=Vaild N=Data invalid)
3. Port rudder sensor data (-180 - 180.0, NULL)
4. Port rudder sensor status (A=Vaild N=Data invalid)

RSD - Radar system data

$--RSD,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,N,H*hh <CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13

1. Origin 1 range, from own ship (0.000 - 999) (see note 2)
2. Origin 1 bearing, degrees from 0 (0.0 - 359.9) (see note 2)
3. Variable range marker 1(VRM1), range (0.000 - 999)
4. Bearing line 1(EBL1), degrees from 0 (0.0 - 359.9)
5. Origin 2 range (0.000 - 999.9) (see note 2)
6. Origin 2 bearing (0.0 - 359.9)(see note 2)
7. VRM2,.9 range (0.000 - 999)
8. EBL2, degrees (0.0 - 360.0)
9. Cursor range, from own ship (0.000 - 999)
10. Cursor bearing, degrees clockwise from 0 (0.0 - 359.9)
11. Range scale in use (0.0625 - 120)
12. Range units (K/N/S)
13. Display rotation (see note 1)

NOTES
1 Display rotation:
C=Course-up, course-over-ground up, degrees true
H=Head-up, ship's heading(center-line) 0 up
N=North-up, true north is 0 up
2 Origin 1 and origin 2 are located at the stated range and bearing from own ship and provide for two independent sets of variable range markers (VRM) and electronic bearing lines (EBL) originating away from own ship position.

THS - True heading & status

$--THS,xxx.x,a*hh<CR><LF>
1 2

1. Heading, degrees True (0.00 to 360.00)
2. Mode indicator (A=Autonomous S=Simulator)

TTM - Tracked target message

$--TTM,xx,x.x,x.x,a,x.x,x.x,a,x.x,x.x,a,c--c,a,a,hhmmss.ss,a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1. Target number (00 to 999)
2. Target distance from own ship (0.000 - 99.999)
3. Bearing from own ship,degrees (0.0 - 359.9)
4. True or Relative (T)
5. Target speed (0.00 - 999.99, null)
6. Target course, degrees (0.0 - 359.9, null)
7. True or Relative
8. Distance of closet point of approach (0.00 - 99.99, null)
9. Time to CPA, min., "-" increasing (-99.99 - 99.99, null)
10. Speed/distance units (N=nm)
11. Target name (null)
12. Target status (L=Lost Q=Acquiring T=Tracking)
13. Reference target (R, NULL otherwise)
14. UTC of data (null)
15. Type of acquisition (A=Automatic M=Manual)

VBW - Dual ground/water speed

$--VBW,x.x,x.x,x,x.x,x.x,x,x.x,x,x.x,x*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10

1. Longitudinal water speed, knots (-9999.999 - 9999.999)
2. Transverse water speed, knots (-9999.999 - 9999.999, null)
3. Status: water speed, A=data valid V=data invalid
4. Longitudinal ground speed, knots (-9999.999 - 9999.999)
5. Transverse ground speed, knots (-9999.999 - 9999.999, null)
6. Status: ground speed, A=data valid V=data invalid
7. Stern transverse water speed, knots (-9999.999 - 9999.999)
8. Status: stern water speed, A=data valid V=data invalid
9. Stern transverse ground speed, knots (-9999.999 - 9999.999)
10. Status: stern ground speed, A=data valid V=data invalid

VDM - UAIS VHF data-link message

!--VDM,x,x,x,x,s--s,x*hh<CR><LF>
1 2 3 4 5 6

1. Total number of sentences needed to transfer the message (1 to 9)
2. Message sentence number (1 to 9)
3. Sequential message identifier (0 to 9, NULL)
4. AIS channel Number (A or B)
5. Encapsulated ITU-R M.1371 radio message (1 - 63 bytes)
6. Number of fill-bits (0 to 5)

VDO - UAIS VHFG data-link own vessel report

!--VDO,x,x,x,x,s--s,x*hh<CR><LF>
1 2 3 4 5 6

1. Total number of sentences needed to transfer the message (1 to 9)
2. Message sentence number (1 to 9)
3. Sequential message identifier (0 to 9, NULL)
4. AIS channel Number (A or B, NULL)
5. Encapsulated ITU-R M.1371 radio message (1 - 63 bytes)
6. Number of fill-bits (0 to 5)

VDR - Set and drift

$--VDR,x.x,T,x.x,M,x.x,N*hh <CR><LF>
1 2 3 4 5 6

1. Direction, degrees (0.00 - 360.00, null)
2. T=True (fixed)
3. Direction, degrees (0.00 - 360.00, null)
4. M=Magnetic (fixed)
5. Current speed (0 - 99.99)
6. N=Knots (fixed)

VHW - Water speed and headings

$--VHW,x.x,T,x.x,M,x.x,N,x.x,K*hh <CR><LF>
1 2 3 4 5 6 7 8

1. Heading, degrees (0.00 - 360.00)
2. T=True (fixed)
3. Heading, degrees (0.00 - 360.00)
4. M=Magnetic (fixed)
5. Speed, knots (0.00 - 9999.99)
6. N=Knots (fixed)
7. Speed, knots (0.00 - 9999.99)
8. K=km/hr (fixed)

VTG - Course over ground and ground speed

$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh <CR><LF>
1 2 3 4 5 6 7 8 9

1. Course over ground, degrees (0.00 - 360.00)
2. T=True (fixed)
3. Course over ground, degrees (No use)
4. M=Magnetic (No Use)
5. Speed over ground, knots (0.00-99.94)
6. N=Knots (fixed)
7. Speed over ground (0.00-99.94)
8. K=km/h (fixed)
9. Mode indicator (A=Autonomous, D=Differential E=Estimated (dead reckoning)
   M=Manual input S=Simulator P=Precision)

XDR - Transducer measurements

$--XDR,a,x.x,a,c--c,……a,x.x, a,c...c*hh<CR><LF>
1 2 3 4 5

1. Transducer type, transducer no. (C, A, F, N, P, R, T, H, V)
2. Measurement data, transducer no. (Transducer no. N)
3. Units of measure, transducer no. (Transducer type, transducer no. N)
   #1=C→C #1=A→D
   #1=D→M #1=F→H
   #1=N→N #1=P→B
   #1=R→I #1=T→R
   #1=H→P #1=V→M
4. Data, varialbe number of transducers
5. Transducer “n”

ZDA - Time and date

```
$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh<CR><LF>
                  1      2  3   4    5  6
```

1. UTC (000000.00 - 235960.99)
2. Day (01 - 31)
3. Month (01 -12)
4. Year (UTC, 1970 - 2037)
5. Local zone, hours (No use)
6. Loca zone, minutes (No use)

Output sentences

See input sentences for OSD and VBW.

ABM - UAIS Addressed binary and safety related message

```
!--ABM,x,x,x,xxxxxxxxx,x,x.x,s--s,x*hh<CR><LF>
          1 2  3      4       5  6    7  8
```

1. Total number of sentences needed to transfer the message (1 - 9)
2. Message sentence number (1 - 9)
3. Message sequence identifier (0 - 3)
4. The MMSI of destination AIS unit for the ITU-R M.1371 message (9 digits)
5. AIS channel for broadcast of the radio message (0 - 3)
6. VDL message number (6 or 12), see ITU-R M.1371
7. Encapsulated data (1 - 63 bytes)
8. Number of fill-bits (0 - 5)

ACK - Acknowledge alarm

```
$--ACK,xxx*hh<CR><LF>
           1
```

1. Local alarm number (identifier) (000 - 999)

BBM - UAIS broadcast binary message

```
$--BBM,x,x,x,x,xx,s--s,x*hh<CR><LF>
          12 3 4 5    6   7
```

1. Total number of sentences needed to transfer the message (1 - 9)
2. Sentence number (1 - 9)
3. Sequential Message identifier (0 - 9)
4. AIS channel for broadcast of the radio message (0 - 3)
5. ITU-R M.1371 message ID (8 or 14)
6. Encapsulated data (1 - 63 bytes)
7. Number of fill-bits, 0 to 5

EVE - General event message

```
$ --EVE,hhmmss.ss,c--c,c--c*hh <CR><LF>
                   1        2     3
```

1. Event time (000000.00 - 235960.99)
2. Tag code used for identification of source of event (RA0001 - RA0010, EI0001 - EI0016, IN0001 - IN0016, II0001 - II0016)
3. Event description (OPERATION)

HTC - Heading/Track control command

$**HTC,A,x.x,a,a,a,x.x,x.x,x.x,x.x,x.x,x.x,x.x,a,a*hh<CR><LF>
1 2 3 4 5 6 7 8 9 10 11 12 13 14

1. Override, A = in use, V = not in use
2. Commanded rudder angle, degrees
3. Commanded rudder direction, L/R = port/starboard
4. Selected steering mode
5. Turn mode R = radius controlled
   T = turn rate controlled
   N = turn is not controlled
6. Commanded rudder limit, degrees (unsigned)
7. Commanded off-heading limit, degrees (unsigned)
8. Commanded radius of turn for heading changes, n.miles
9. Commanded rate of turn to heading changes, deg/min
10. Commanded heading-to-steer, degrees
11. Commanded off-track limit, n.miles (unsigned)
12. Commanded track, degrees
13. Heading reference in use, T/M
14. Sentence status

VSD - UAIS Voyage static data

$--VSD,x.x,x.x,x.x,c--c,hhmmss.ss,xx,xx,x.x,x.x*hh<CR><LF>
1 2 3 4 5 6 7 8 9

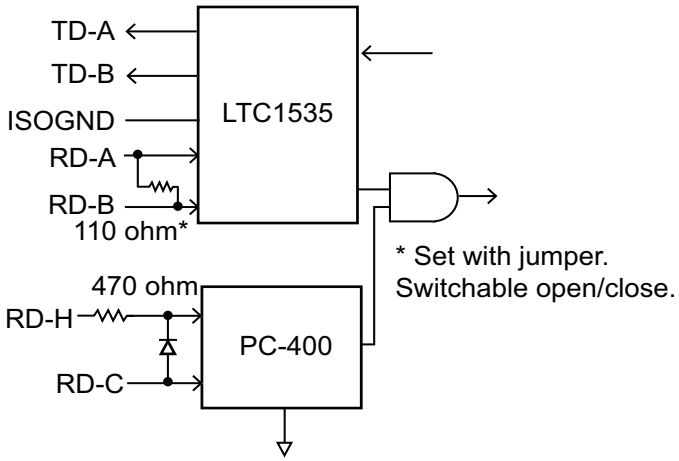
1. Type of ship and cargo category (0 - 255)
2. Maximum present static draught (0 to 25.5 meters, null)
3. Persons on-board (0 - 8191, null)
4. Destination (1 - 20 characters, null)
5. Estimated UTC of arrival at destination (000000.00 - 235959.99)
6. Estimated day of arrival at destination (00 to 31(UTC))
7. Estimated month of arrival at destination (00 to 12(UTC))
8. Navigational status (0 - 15, null)
9. Regional application flags (0 - 15)

XTE - Xross-track error, measure

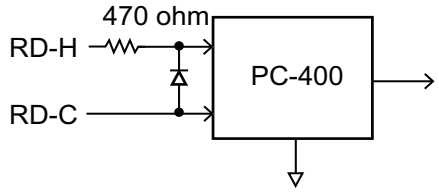
$--XTE,A,A,x.x,a,N,a*hh<CR><LF>
1 2 3 4 5 6

1. Status: A=data valid V=LORAN C blink or SNR warning
2. Status: V=LORAN C blink or SNR warning
3. Magnitude of cross-track error (0.0000 - 9.9999)
4. Direction to steer, L/R
5. Units, nautical miles (fixed)
6. Mode indicator (A=Autonomous mode D=Differential mode S=Simulator mode)

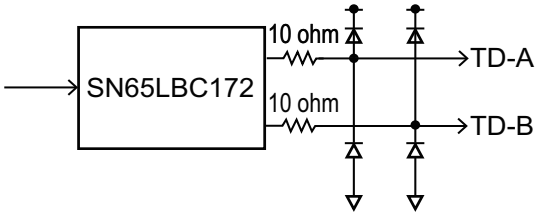
Serial Interface



Sensor Adapter: IEC 61162-2/1 input/output



Sensor Adapter: IEC 61162-1 input



Sensor Adapter: IEC 61162-1 output

APPENDIX 4 RA/IF BOARD JUMPER VALUES

The values for each jumper block on the RA/IF board (24P0140) are shown below.

CH1/CH2 signal settings

J1/J8 HD-TERM	
1-2	1.2 kΩ
2-3	OFF

J2/J9 HD-PULL UP	
1-4	5V IN
2-5	OC (560Ω)
3-6	OC (1 kΩ)

J3/J16 VID-TERM	
1-5	75Ω
2-6	50Ω
3-7	1.2 kΩ
4-8	100 kΩ

J4/J12 HD-POLARITY	
1-2	NORMAL
2-3	REVERSE

J5/J18 BP-TERM	
1-2	1.2 kΩ
2-3	OFF

J6/J19 BP-PULL UP	
1-4	5V IN
2-5	OC (560Ω)
3-6	OC (1 kΩ)

J10/J22 TRG-TERM	
1-5	50Ω
2-6	75Ω
3-7	180kΩ
4-8	1.2 kΩ

J13/J24 BP-PULSE NUM	
1-2	2048
2-3	1024

Input bypass settings (CH2 only)

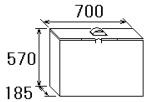
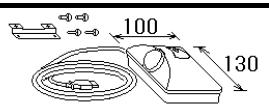
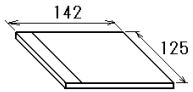
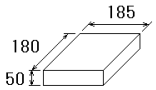
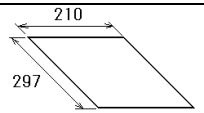
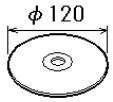
J7/J11 HD-INTERFACE	
1-2	ADJUST
2-3	BYPASS

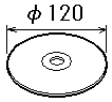
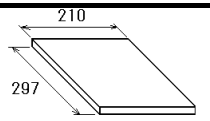
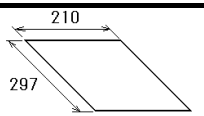
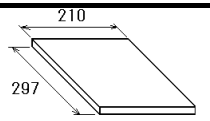
J14/J15 VID-INTERFACE	
1-2	ADJUST
2-3	BYPASS

J17/J20 BP-INTERFACE	
1-2	ADJUST
2-3	BYPASS

J21/J23	
1-2	ADJUST
2-3	BYPASS

PACKING LIST FMD-3100-*

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ﾊﾟﾈﾙPC部箱詰品 PANEL COMPUTER UNIT COMPLETE SET		PCU-3000-* 000-024-894-00 **	1
ﾄﾗｯｸﾎﾞｰﾙ操作部 TRACKBALL CONTROL UNIT		RCU-030-* 000-024-900-00 **	1
付属品 ACCESSORIES			
DVD-R書込品 FMD-3100 INSTALL DVD		2450112- 001-305-330-00	1
DVDﾄﾞﾗｲﾌﾞ DVD DRIVE		DVSM-PT58U2V-BK 000-190-963-10	1
工事材料 INSTALLATION MATERIALS			
工事材料 INSTALLATION MATERIALS		CP24-03101 001-262-570-00	1
図書 DOCUMENT			
ﾄﾞﾝｸﾞﾙｲﾝﾌｫﾒｰｼｮﾝｼｰﾄ DONGLE INFORMATION SHEET		999-999-085-0*	1 (*)
取扱説明CD OPERATOR'S MANUAL CD		FMD3100 O/M *CD-ROM*E 000-178-842-1*	1 (*1)

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
取扱説明CD OPERATOR'S MANUAL CD		FMD3100 O/M *CDROM*J 000-179-364-1*	1 (*2)
操作要領書 OPERATOR'S GUIDE		OS*-44840-* 000-178-756-1*	1
装備設定要領書 INSTRUCTION MANUAL		*42-01311-* 000-178-761-1*	1
装備要領書 INSTALLATION MANUAL		IM*-44840-* 000-178-759-1*	1

1.ｺｰﾄﾞ番号末尾の[**]は、選択品の代表ｺｰﾄﾞを表します。
1.CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

2.(*1)の書類は、英文仕様専用
2.(*1) MARKED DOCUMENTS ARE FOR ENGLISH SET ONLY.

3.(*2)の書類は、和文仕様専用
3.(*2) MARKED DOCUMENTS ARE FOR JAPANESE SET ONLY.
4.(*)は、ﾀﾞﾐｰｺｰﾄﾞに付き、注文できません。
4.(*) THIS CODE CANNOT BE ORDERED.

(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

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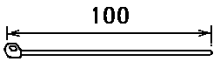
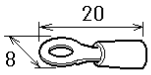
FURUNO

CODE NO.	001-262-570-00	24AN-X-9401 -0
TYPE	CP24-03101	1/1

工事材料表

INSTALLATION MATERIALS

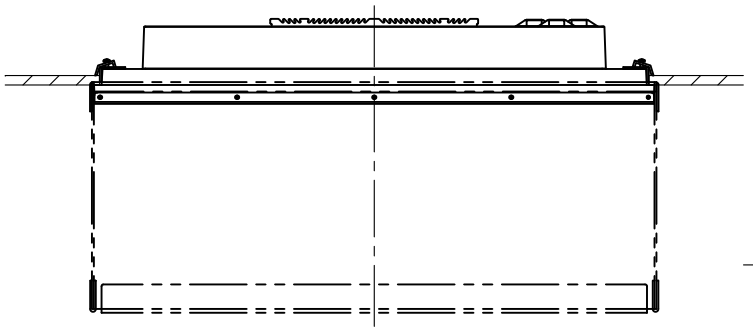
番 号 NO.	名 称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ｺﾝﾍﾞｯｸｽ CABLE TIE		CV-100N CODE NO. 000-162-167-10	6	
2	圧着端子 CRIMP-ON LUG		FV1.25-4(LF) RED CODE NO. 000-166-666-10	6	

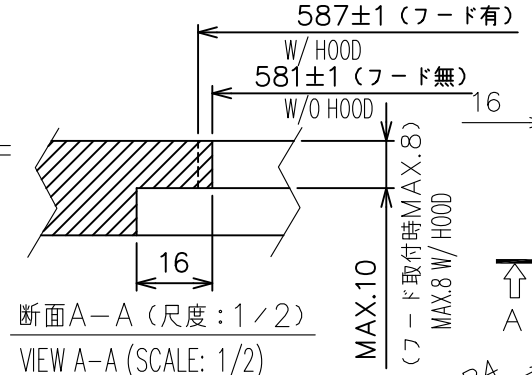
型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。 なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

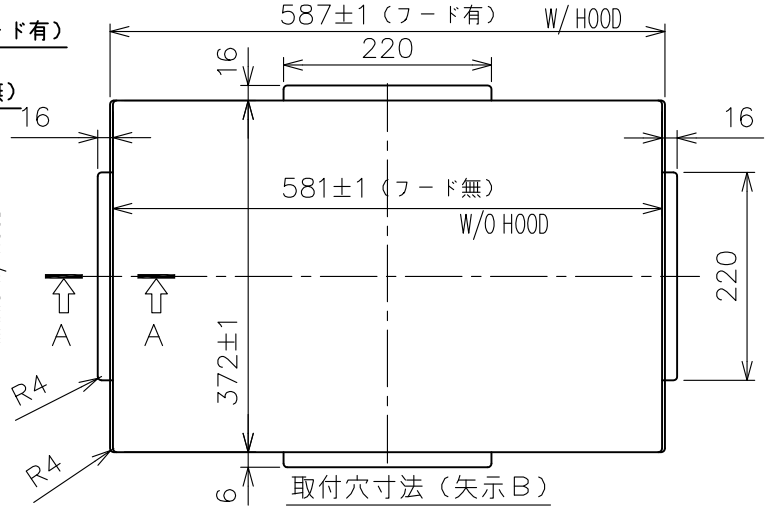
（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

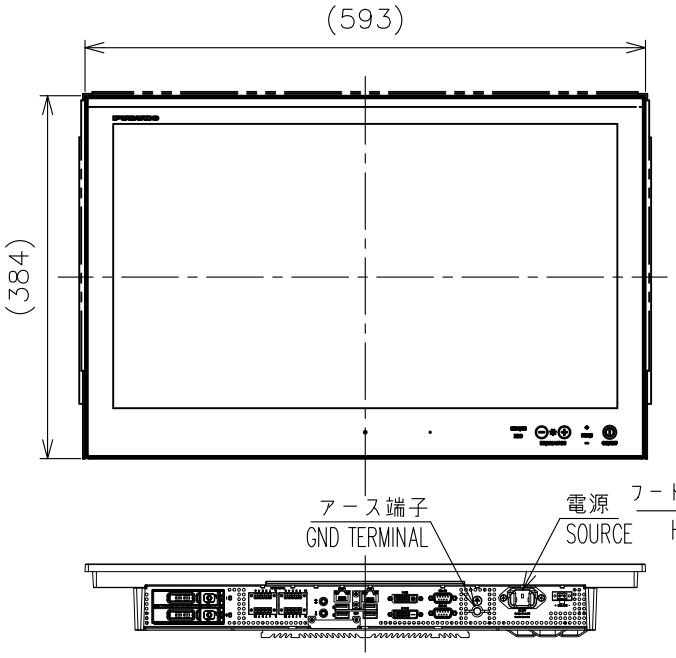


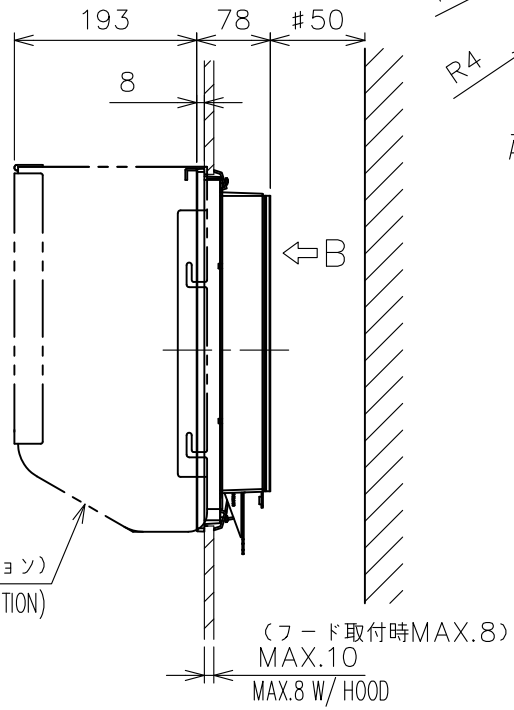


断面A－A（尺度：1／2）
VIEW A-A (SCALE: 1/2)



取付穴寸法（矢示Ｂ）
CUTOUT DIMENSIONS (VIEW B)





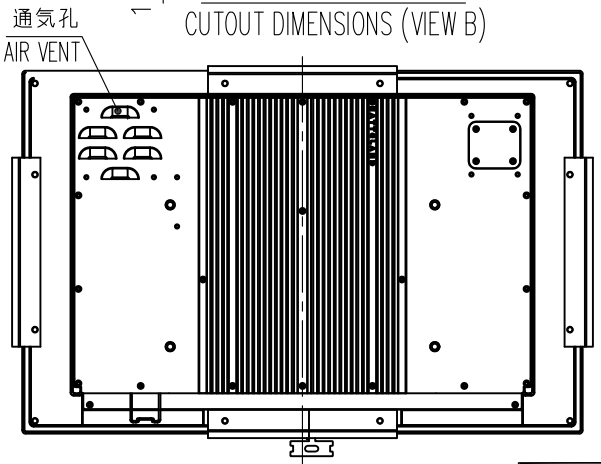


表1 TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3
500<L≦1000	±4

注　記　１）　#印寸法は最小サービス空間寸法とする。
　　２）　指定外の寸法公差は表１による

NOTE　1.　TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
　　2.　#: MINIMUM SERVICE CLEARANCE.

DRAWN 20/Jan/2014 T.YAMASAKI		TITLE	PCU-3000
CHECKED 20/Jan/2014 H.MAKI		名称	パネルPC部（埋込装備）
APPROVED 20/Jan/2014 H.MAKI	FMD-3100		外寸図
SCALE 1/8 MASS 13.7 ±10% kg	質量はオプションを含まず。 MASS DOES NOT INCLUDE OPTION.	NAME	PANEL COMPUTER UNIT (FLUSH MOUNT)
DWG.No. C4484-G04- D	REF.No. 24-016-100G-2		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

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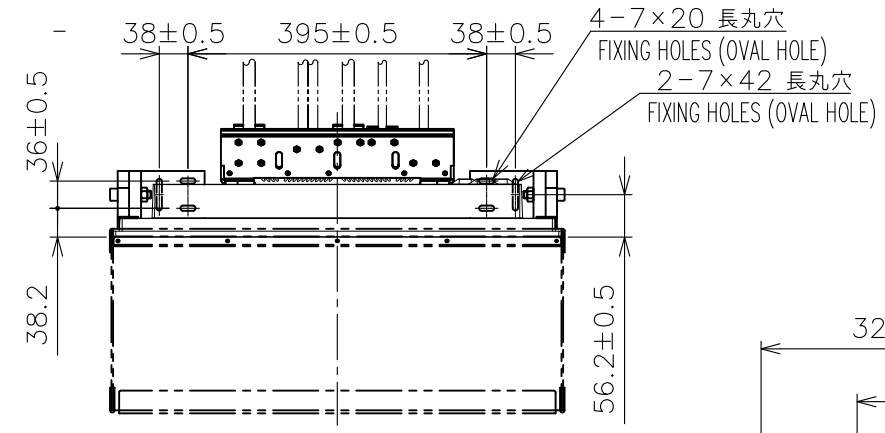
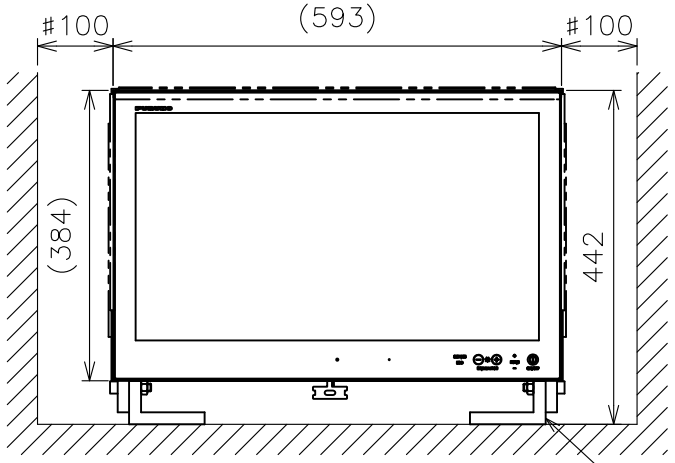
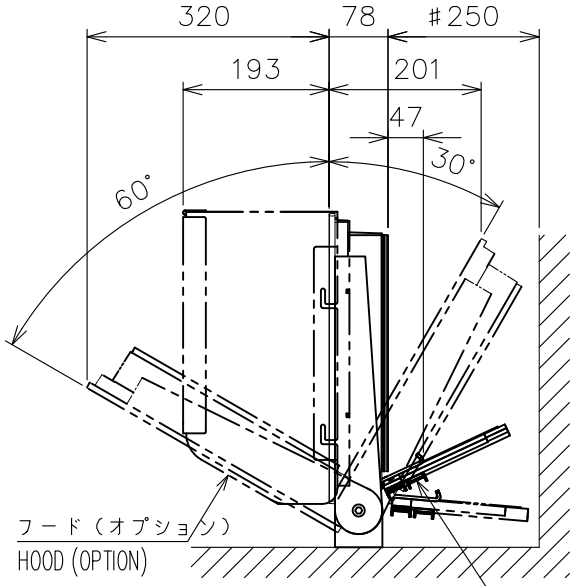
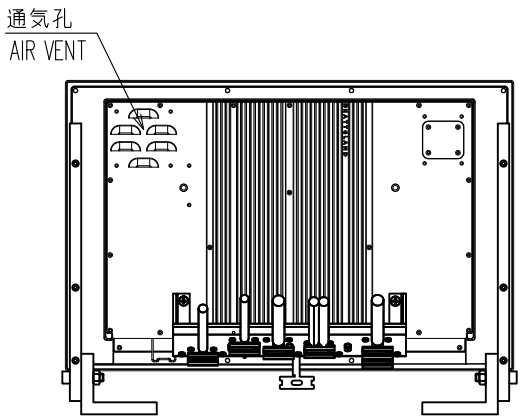
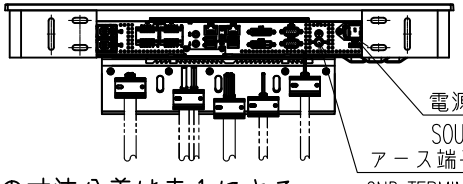
FURUNO











ケーブルクランプ（オプション）
CABLE CLAMP (OPTION)

表1　TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3
500<L≦1000	±4

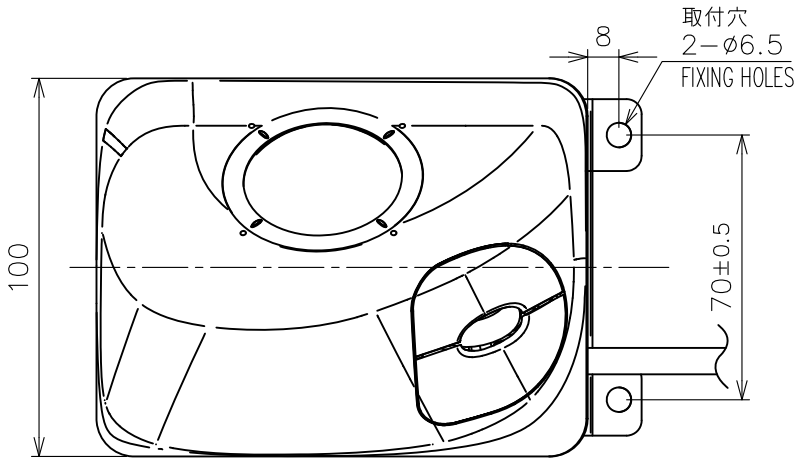
注記　1）指定外の寸法公差は表1による
　　2）＃印寸法は最小サービス空間寸法とする
　　3）取付ネジはタッピンネジ呼び径6×30、またはM6ボルトを使用のこと。

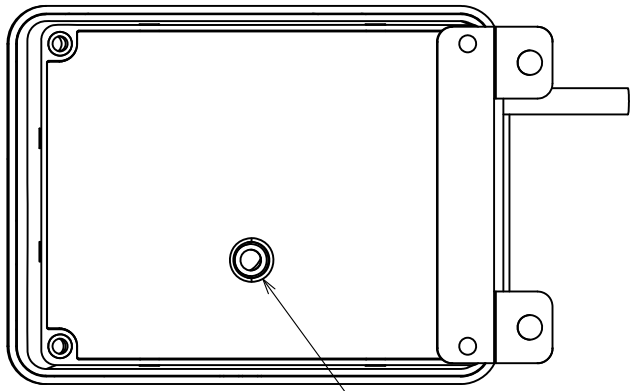
NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø6x30 OR M6 BOLTS FOR FIXING THE UNIT.

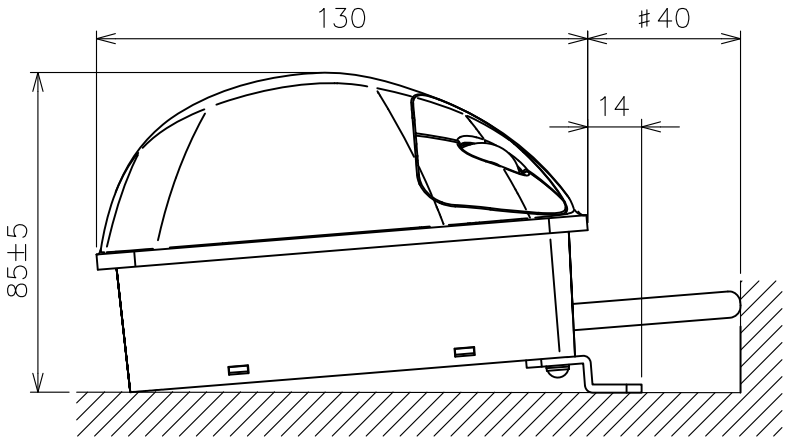
DRAWN 20/Jan/2014 T.YAMASAKI		TITLE	PCU-3000
CHECKED 20/Jan/2014 H.MAKI		名称	パネルPC部（卓上装備）
APPROVED 20/Jan/2014 H.MAKI	FMD-3100		外寸図
SCALE 1/10 MASS 13.7 ±10% kg	質量はオプションを含まず。 MASS DOES NOT INCLUDE OPTION.	NAME	PANEL COMPUTER UNIT (TABLETOP MOUNT)
DWG.No. C4484-G05- B	REF.No. 24-016-200G-1		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO







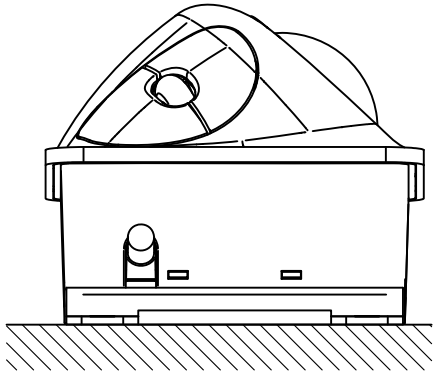


表1 TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

注　記　1）　指定外の寸法公差は表１による。
　　2）　＃印寸法は最小サービス空間寸法とする。
　　3）　取付ネジはトラスタッピンネジ呼び径５Ｘ２０を使用のこと。

NOTE　1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
　　2. #: MINIMUM SERVICE CLEARANCE.
　　3. USE TAPPING SCREWS ø5x20 FOR FIXING THE UNIT.

DRAWN 6/Nov/2013 T.YAMASAKI		TITLE	RCU-030
CHECKED 6/Nov/2013 H.MAKI		名称	トラックボール操作部（取付金具）
APPROVED 7/Nov/2013 H.MAKI	FMD-3100		外寸図
SCALE 1/2 MASS 0.4 ±10% kg	質量は2mケーブルを含む。 MASS INCLUDES 2m CABLE.	NAME	TRACKBALL CONTROL UNIT (FIXTURE MOUNT)
DWG.No. C4484-G01- A	REF.No. 24-016-110G-0		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

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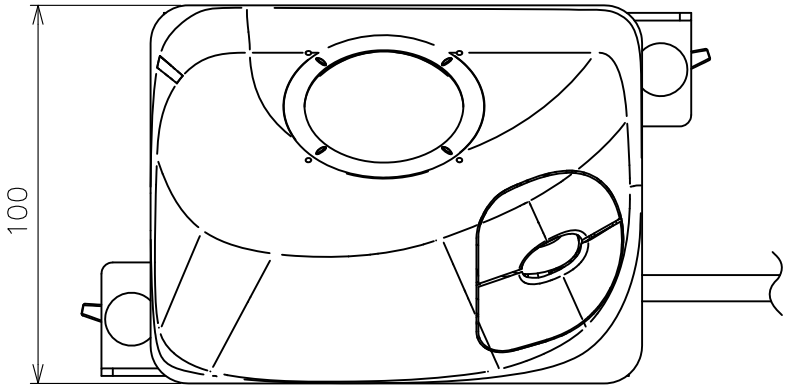
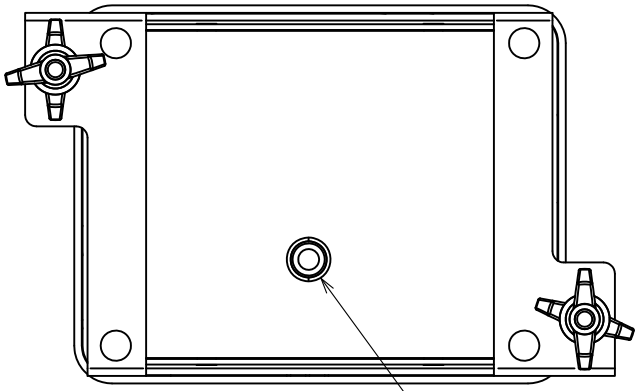
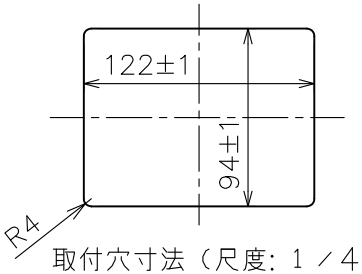


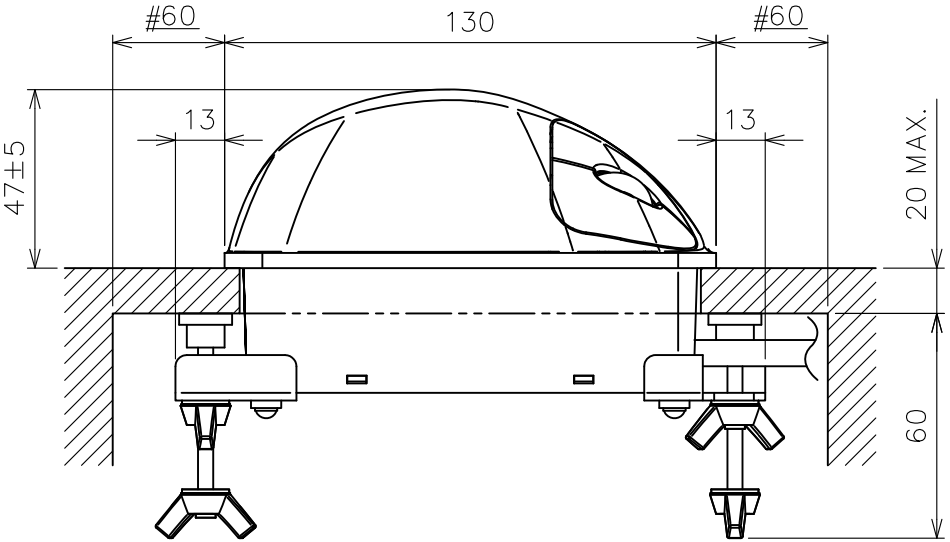


底面図
BOTTOM VIEW

水抜き穴
DRAIN



取付穴寸法（尺度：１／４）
CUTOUT DIMENSIONS (SCALE: 1/4)



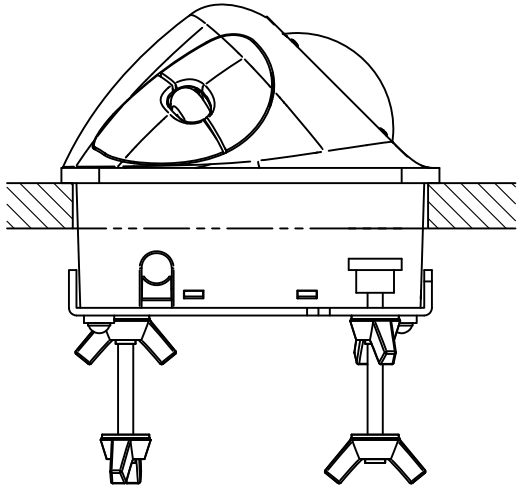


表1 TABLE 1

寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

注　記　１）　指定外の寸法公差は表１による。
　　２）　＃印寸法は最小サービス空間寸法とする。

NOTE　1.　TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
　　2.　#: MINIMUM SERVICE CLEARANCE.

DRAWN 6/Nov/2013 T.YAMASAKI		TITLE	RCU-030
CHECKED 6/Nov/2013 H.MAKI		名称	トラックボール操作部（埋込装備）
APPROVED 7/Nov/2013 H.MAKI	FMD-3100		外寸図
SCALE 1/2 MASS 0.5 ±10% kg	質量は2mケーブルを含む。 MASS INCLUDES 2m CABLE.	NAME	TRACKBALL CONTROL UNIT (FLUSH MOUNT)
DWG.No. C4484-G02- A	REF.No. 24-016-120G-0		OUTLINE DRAWING

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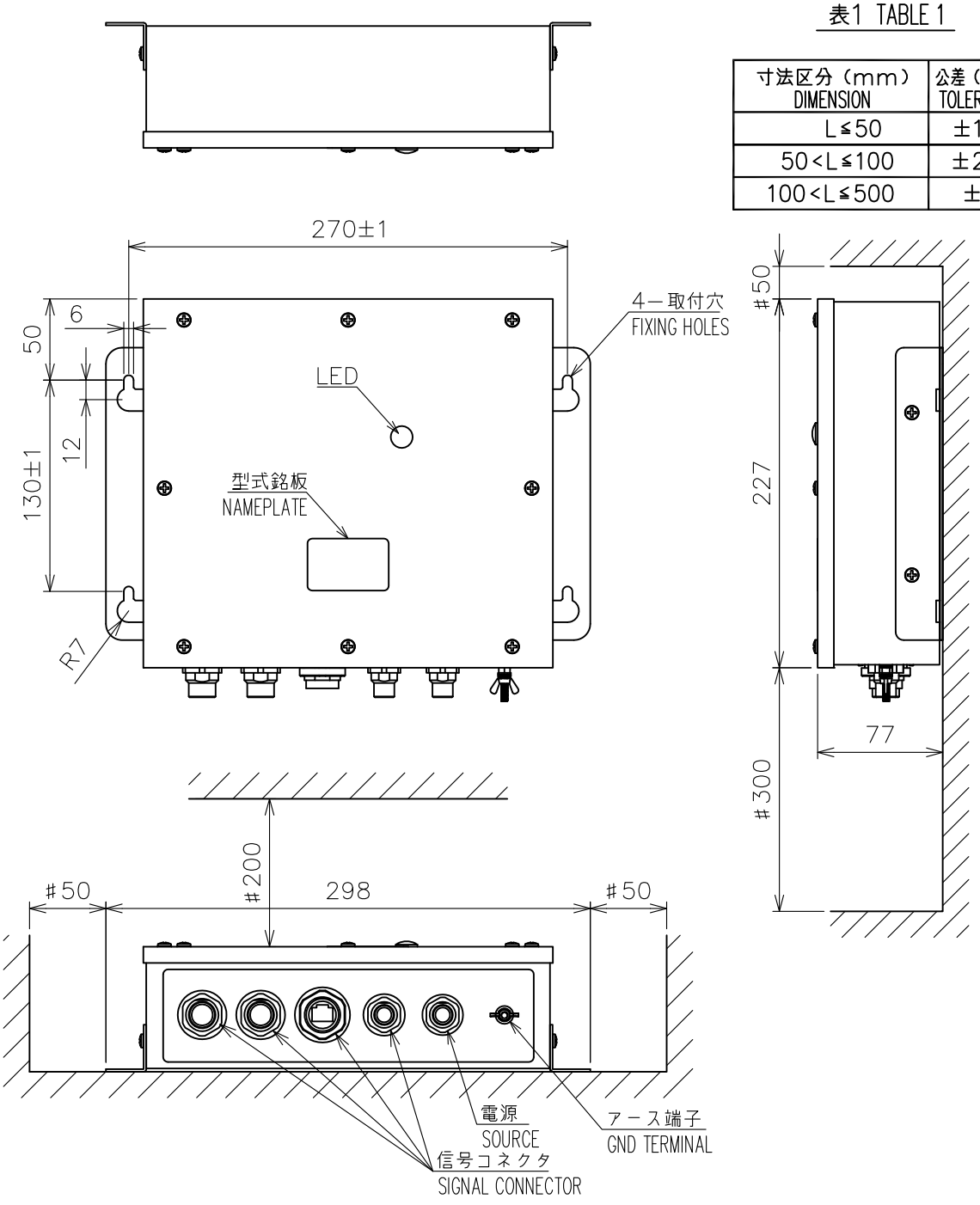
FURUNO ELECTRIC CO., LTD.

表1 TABLE 1

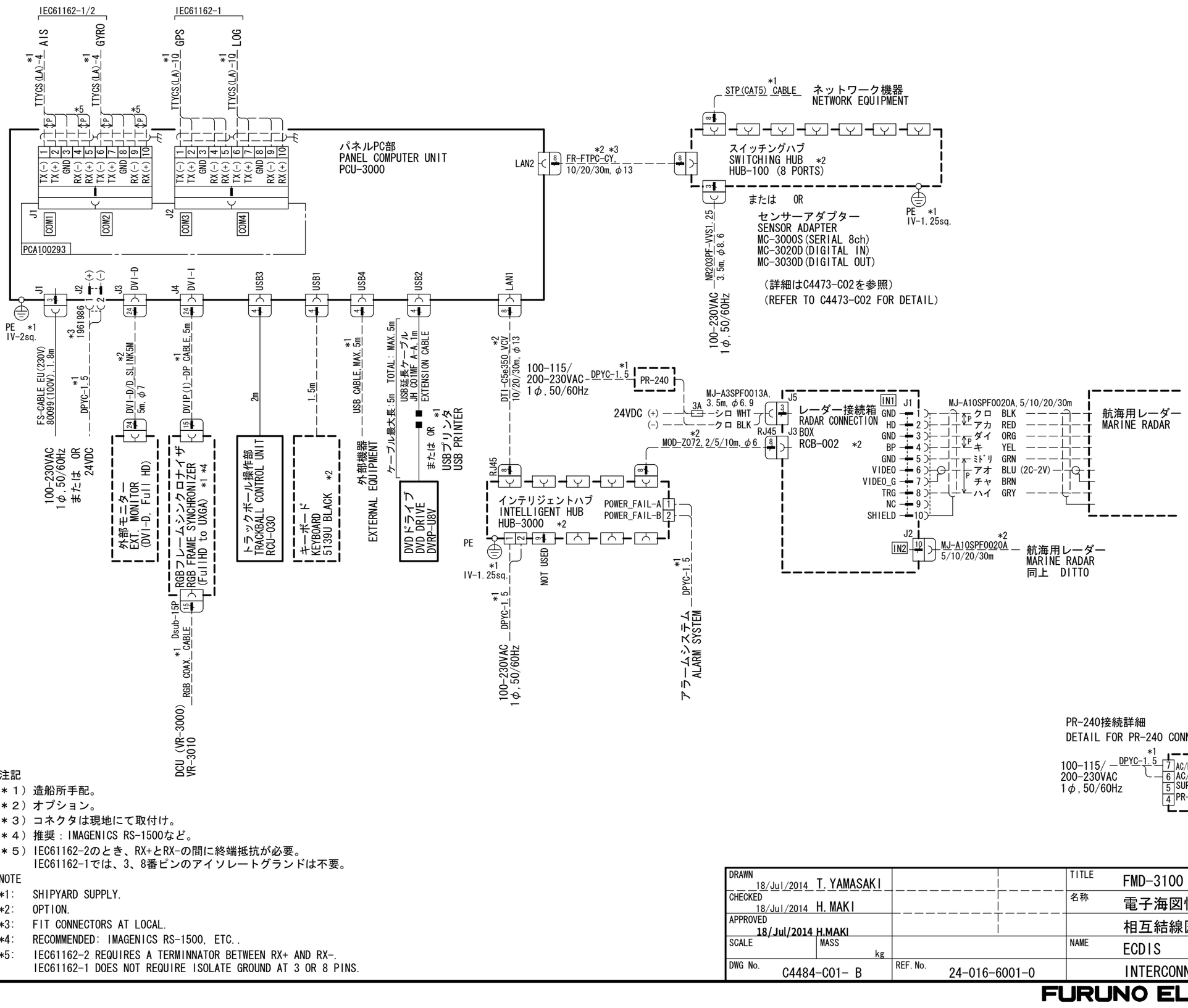
寸法区分（mm） DIMENSION	公差（mm） TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3



注　記　1）　指定外の寸法公差は表１による。
　　2）　＃印寸法は最小サービス空間寸法とする。
　　3）　取付用ネジはトラスタッピンネジ呼び径５ｘ２０を使用のこと。
　　4）　壁掛装備は、必ずコネクタが下方となるよう取付けること。

NOTE　1.　TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
　　2.　#: MINIMUM SERVICE CLEARANCE.
　　3.　USE TAPPING SCREWS ø5x20 FOR FIXING THE UNIT.
　　4.　FOR BULKHEAD MOUNT, FACE THE CONNECTORS DOWMNWARD.

DRAWN 10/Dec/2013 T.YAMASAKI		TITLE RCB-002
CHECKED 10/Dec/2013 H.MAKI		名称 レーダー接続箱（壁掛・卓上装備）
APPROVED 11/Dec/2013 H.MAKI	FMD-3100	外寸図
SCALE 1/4 MASS 3.0 ±10% kg		NAME RADAR CONNECTION BOX (BULKHEAD/ TABLETOP MOUNT)
DWG. No. C4484-G03- B	REF. No. 24-016-130G-1	OUTLINE DRAWING

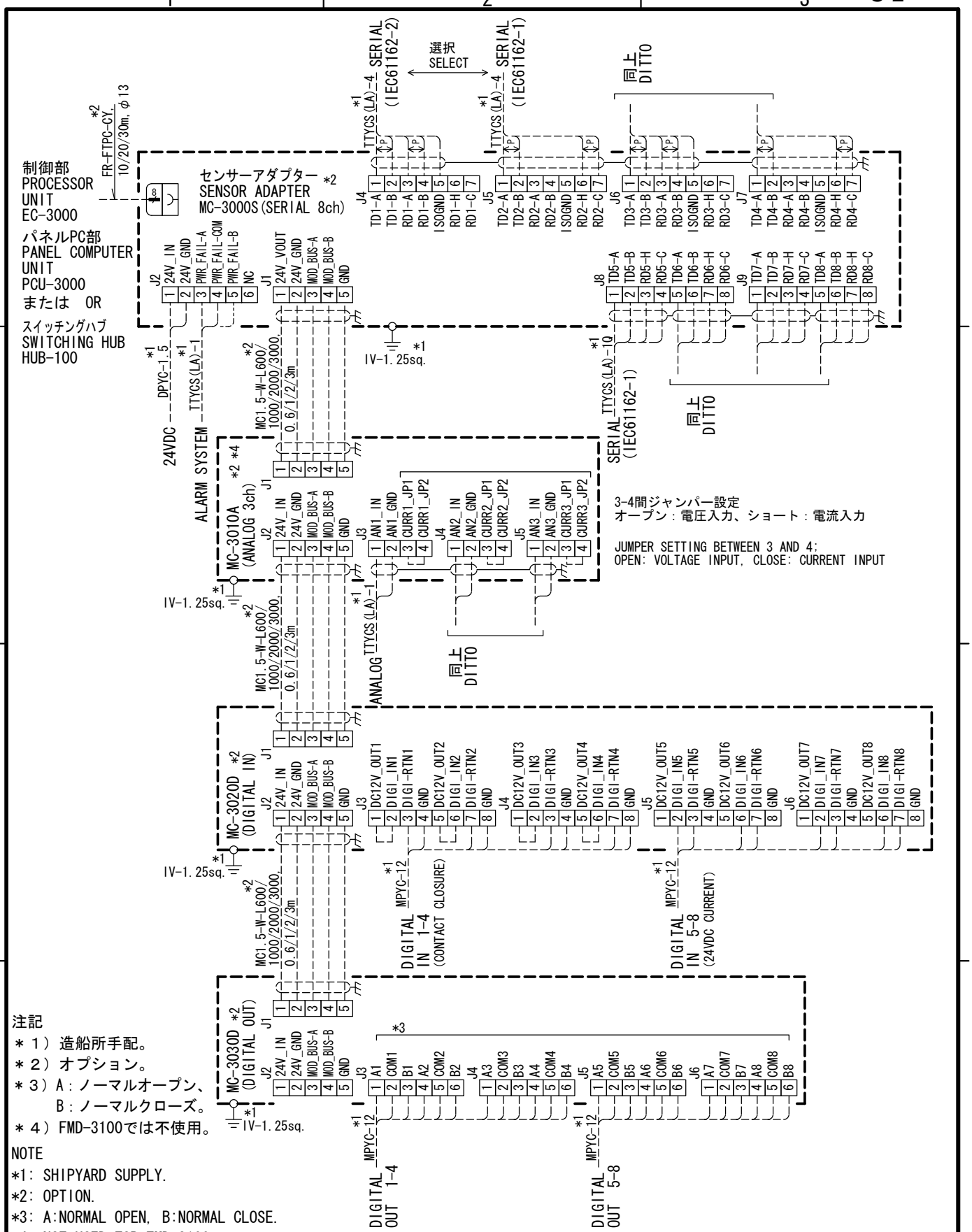


注記
＊１）造船所手配。
＊２）オプション。
＊３）コネクタは現地にて取付け。
＊４）推奨：IMAGENICS RS-1500など。
＊５）IEC61162-2のとき、RX+とRX-の間に終端抵抗が必要。
IEC61162-1では、3、8番ピンのアイソレートグランドは不要。

NOTE
*1: SHIPYARD SUPPLY.
*2: OPTION.
*3: FIT CONNECTORS AT LOCAL.
*4: RECOMMENDED: IMAGENICS RS-1500, ETC..
*5: IEC61162-2 REQUIRES A TERMINNATOR BETWEEN RX+ AND RX-.
IEC61162-1 DOES NOT REQUIRE ISOLATE GROUND AT 3 OR 8 PINS.

DRAWN 18/Jul/2014 T.YAMASAKI		TITLE	FMD-3100
CHECKED 18/Jul/2014 H.MAKI		名称	電子海図情報表示装置
APPROVED 18/Jul/2014 H.MAKI			相互結線図
SCALE / MASS kg		NAME	ECDIS
DWG No. C4484-C01- B	REF. No. 24-016-6001-0		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.



注記
＊１）造船所手配。
＊２）オプション。
＊３）A：ノーマルオープン、
　　B：ノーマルクローズ。
＊４）FMD-3100では不使用。

NOTE
*1: SHIPYARD SUPPLY.
*2: OPTION.
*3: A:NORMAL OPEN, B:NORMAL CLOSE.
*4: NOT USED FOR FMD-3100.

DRAWN 6/Jan/2014 T.YAMASAKI			TITLE MC-3000S/3010A/3020D/3030D
CHECKED 6/Jan/2014 H.MAKI			名称 センサーアダプター
APPROVED 6/Jan/2014 H.MAKI		FCR-2819 SER. FMD-3100/3200/3300	相互結線図
SCALE	MASS kg		NAME SENSOR ADAPTER
DWG.No. C4473-C02- D		REF.No. 24-014-6003-2	INTERCONNECTION DIAGRAM